

**WIRELESS IN THE RIFF WAR—Exclusive to "P.W."**

# Popular Wireless

and

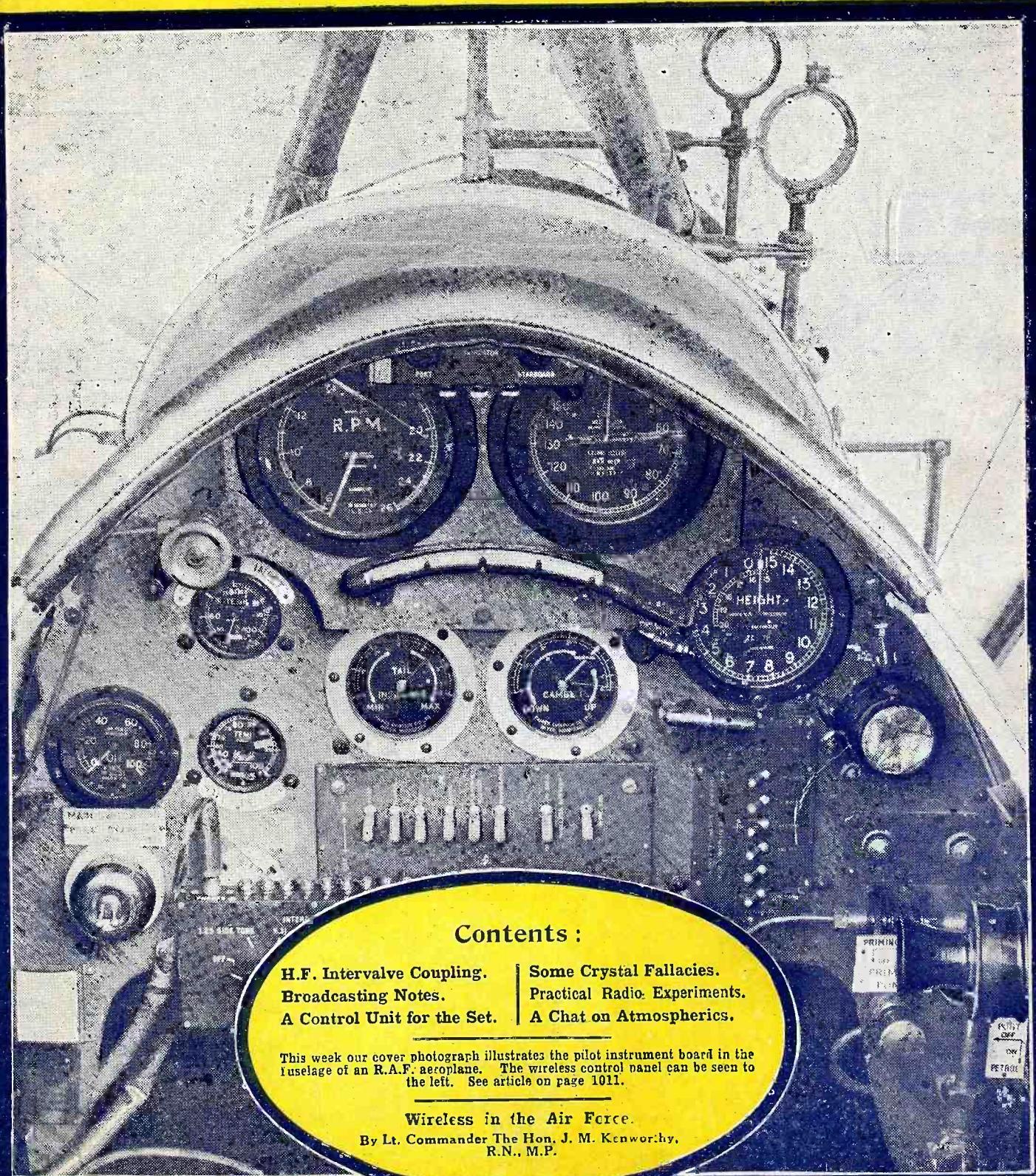
**Wireless Review**

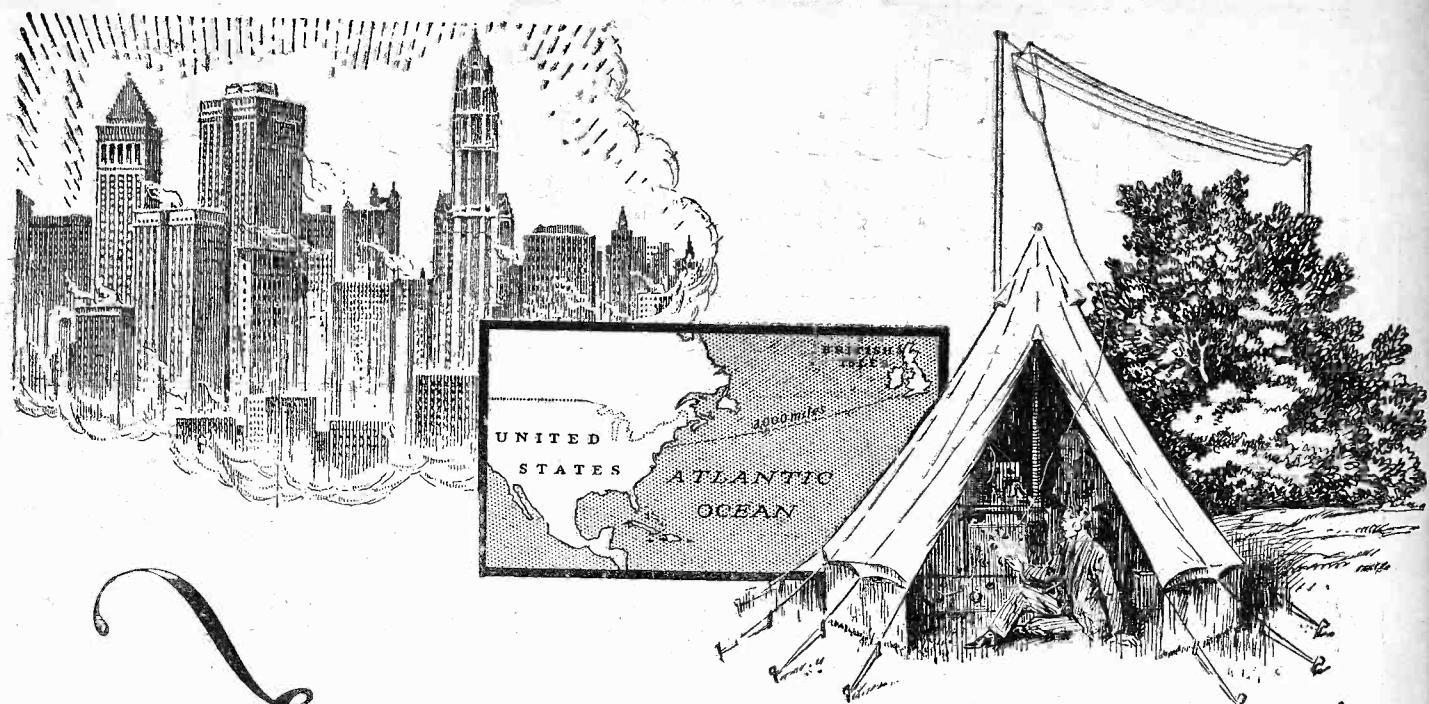
No. 167. Vol. VII.

August 8th, 1925.

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EVERY THURSDAY.

Scientific Adviser : SIR OLIVER LODGE, F.R.S., D.Sc.





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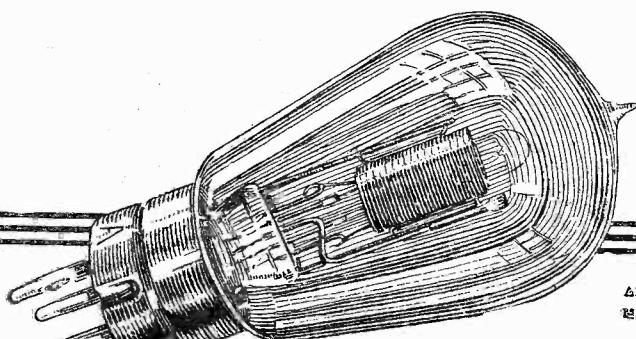
## Communication with America on portable apparatus

At a field gathering held recently by the Golders Green and Hendon Radio Society (assisted by the Hounslow and Inland Revenue Radio Societies), communication with the United States was effected on a portable apparatus.

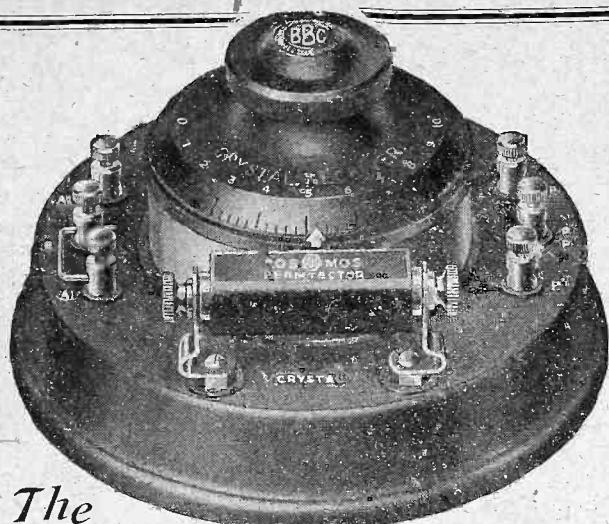
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*The*

# COSMOS CRYSTAL SET

A new type of Crystal Set specially designed for use in connection with the new Daventry High Power Station but also suitable for ordinary B.B.C. reception. It embodies a number of DISTINCTIVE FEATURES. The circuit is arranged for selectivity by the use of a simple three-way switch connecting with three tappings on either of the Plug-in-Coils used. One of these coils is for the ordinary B.B.C. wave-band (300-650 metres), and the other for the High Power Station (1,200-3,000 metres). The coils are concealed in the base of the set and are easily plugged-in and changed in a second. Tuning is effected by a variable condenser, and two Aerial terminals with a small fixed condenser accommodates aerials of varying capacities. The Detector is either a covered Cat's Whisker Type or the "Cosmos-Permitector" and can be fixed or detached in a moment. The Set can be used on a Table or on a Wall. In the latter case the headphones can be hung on the condenser knob, thus making a neat and compact arrangement.

**PRICES :**

"Cosmos" Crystal Set only with enclosed Crystal Detector and one Plug-in-Coil (either B.B.C. Band or H.P. Daventry) .....	25/-
As above, but with the "Cosmos" Permitector (and one spare Permitector) .....	28/-
Plug-in-Coil (either B.B.C. Band or Daventry) .....	4/6

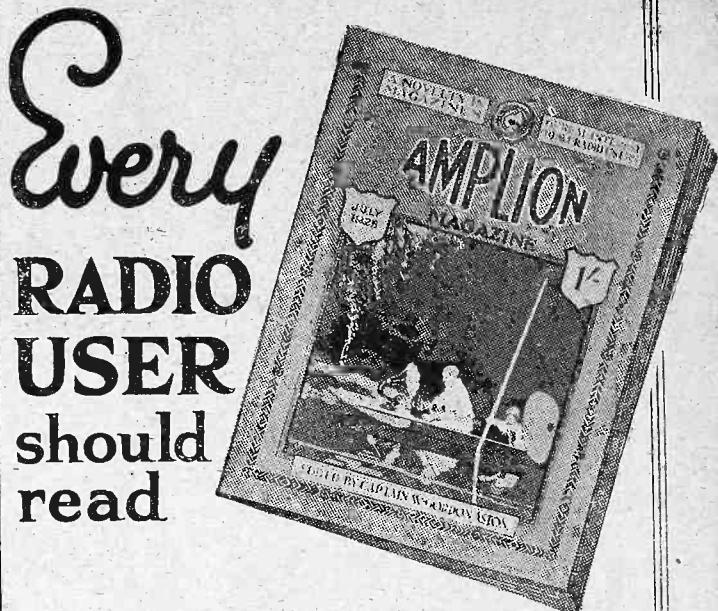
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**METRO-VICK SUPPLIES LTD.,**

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*The*

# AMPLION MAGAZINE

**Nº1 (JULY 1925)  
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**J. C. W. REITH, and**  
**W. WITT BURNHAM**



## Ping! and never a discord from the Loud Speaker

EVER since the first Dull Emitters were used, wireless enthusiasts knew that microphonic noises were inevitable. A touch on the table—an adjustment of a rheostat—even vibration set up by passing traffic—and a succession of discords would mar the pleasure of otherwise perfect Loud Speaker reproduction.

So acute has become this problem of preventing microphonic noises when Dull Emitters are used that various ingenious shock-proof valve holders are on the market. All these devices are merely the outcome of an endeavour to eliminate harmful vibration. They are just an effort to improve an admitted defect.

But there is now available a Dull Emitter which does not need the aid of any form of shock-proof valve-holder—the new Cossor Wuncell. And here microphonic noises have been completely banished by the simple expedient of improving the design of the valve itself.

Everyone should know that these noises are principally caused by the vibration of two parts—the filament and the Grid. In the ordinary Dull Emitter the filament is long, straight and slender. It is usually supported in a vertical position and kept taut by means of two electrodes sprung apart. The Grid is generally a spiral of wire. With such a design, therefore, the risk of vibration is very grave.

But the Wuncell employs an entirely different principle. Its filament is arched and stayed at its centre by means of a third support. Its Grid is also arched in formation and built up on a stout metal grid band—each turn of the wire being anchored in three distinct places. The result is that the Wuncell is to all intents and purposes quite vibration-proof. The technical staff of *Amateur Wireless* reported that "... the valves are entirely free from microphonic noises. In fact no disturbances were heard when the bench on which the Valves were placed was thumped hard."

But the absence of microphonic noises is only one distinctive feature of the Wuncell. Every user marvels at its wonderful sensitiveness, its unprecedented volume and its exceptionally long life. If you have not yet investigated its merits see your Dealer about it at once, or write to us for interesting descriptive literature.

### Have you a Loud Speaker?

In order to get the best results from a Loud Speaker you require ample power without the necessity of working your valves to their limit. This means that you need a proper Loud Speaker Valve designed for the job. The new Cossor W3 has been specially built for power work with only a moderate high tension voltage. Use it in place of your ordinary L.F. Valve and you'll be amazed at the tremendous increase in volume.

Technical Data:  
Filament voltage, 1·8 to 2  
Fil. consumption, .5 amps.  
Plate voltage, 50 to 150

Cossor W3

18/6

# Cossor Wuncell

the long life Dull Emitter.

Advertisement of A. C. Cossor, Ltd., Highbury Grove, N.S.

Gilbert Ad. 3249

# Popular Wireless

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The Radio Weekly with the largest Circulation

## RADIO NOTES AND NEWS.

A Radio University?—B.B.C.'s Continental Rivals—Against the Law—Paris Experiments  
—Cyril Goyder Again—Arctic Radio—That Chitos Circuit—F.L.'s Time Signal.

### A Radio University?

LISTENERS who pooh-poohed the idea of a Radio University as being impracticable, are having to revise their ideas in view of the fact that there is now a possibility of the B.B.C. erecting a studio at Oxford University. The broadcasting of debates and lectures from there would add immense prestige to the present system of educational broadcasting; and, provided the hours of entertainment were not encroached upon, there is not a single word that can be said against this very promising project.

### B.B.C.'s Continental Rivals.

SEVERAL readers have written to draw my attention to the remarkable power of certain Continental stations, as compared with B.B.C. output, and one Suffolk correspondent says outright "Radio-Toulouse is my best station, and San Sebastien is quite as good as any of the low-wave British stations." This is an exceptional case, but I am inclined to think that the outstanding excellence of the B.B.C. transmissions is becoming a thing of the past, and that several of the Continental concerns can now give them a good run for their money.

### Against the Law.

RECENT advertisements of Sylverex, Ltd., in connection with a Crystal Prize scheme, have had an unexpected sequel. Owing to the reproduction of bank-notes in the advertisements—which is a violation of the law—all these advertisements must be destroyed! New blocks, deleting all reference to Bank of England notes, are being made, and dealers are asked to assist the firm in this matter by destroying any of the old reprints which they may have on hand.

### Protecting the Listener.

THE Radio Association's scheme for issuing a sign of "Approved Wireless Service" to qualified dealers, has aroused enormous interest amongst listeners. Applicants who wish to display the sign at their business premises can obtain full particulars of the scheme upon inquiry of the Hon. Secretary, Radio Association, Sentinel House, Southampton Row, W.C. 1.

The names of approved firms will be published from time to time in POPULAR WIRELESS.

### The Highest Aerial.

"WILL Daventry's aerial be higher than that of the new Post Office station at Rugby?" inquires a correspondent in the latter town, who signs himself "School-House." The question is not easily answered, for, although



Jackie Coogan, the famous cinema "star," being presented with a crystal set. He is an enthusiastic listener.

the Rugby masts are much higher than five hundred feet—which is the height at which Daventry's aerial swings—the latter station stands on higher ground, and in consequence the Rugby aerial is actually nearer sea-level than that of the B.B.C.'s super-station.

### Where the B.B.C. Scores.

A WELL-KNOWN American business man who spends a good deal of his time in the country, told me some months ago that the inspiring talks upon the Ether, by Sir Oliver Lodge, and the series by Sir William Bragg, were the best things the B.B.C. ever "put on the air"; and they were far ahead of any talks he ever heard on the other side of the Atlantic. I am reminded of his words by the fact that Mr. Julian Huxley, of Oxford University, is to give us a series of lectures on "The

Stream of Life," dealing with its origin and evolution, whilst in the U.S.A. they are trying to forget the farce of "Monkeyville."

### Broadcasting in India.

M R. H. A. POPLEY, of 44, Canning Road, Addiscombe, Croydon, would be very glad to get into touch with any reader who has had practical experience of the reception of broadcasting in India. He is thinking of taking out a 3- or 4-valve set to tune in Calcutta and Bombay at 1,200 and 800 miles respectively, and, of course, he would like to pick up Europe if possible.

Any information regarding the actual conditions in India, and the licences necessary, would be greatly appreciated.

### The Paris Experiments.

RADIO-LOUIS-ANCEL, the new Paris station which has such a partiality for gramophone records and blowing bugle-calls, is now experimenting upon the very low wave-lengths. Several readers have reported his radio-d invitation to go down to the shorter waves, but I have not had reports of any British station tuning him in below 200 metres or so.

### Relaying American Programmes.

AMBITIONOUS schemes are afoot on both sides of the Atlantic for the relaying of programmes between Europe and America this winter. The technical arrangements are so promising that the B.B.C. has been encouraged definitely to set aside part of its programme time as "American Programme Period." Similar provision is being made in the States, and although there is a good deal of experimenting to be done before the regular exchange of programmes can be guaranteed, there is every prospect that large quantities of jazz will be imported direct from Dixie by the "air-line."

### On 23 Metres.

THOSE radio aristocrats who can tune down to 23 metres will be interested to know that 5 L.S is the station of A. J. Stevens, Ltd., 56, Humber Road, Blackheath, S.E.3. The station is also

(Continued on page 1000.)

## NOTES AND NEWS.

(Continued from page 999.)

authorised for transmission on 43 metres, and on the band between 90 and 200 metres.

### Wireless as a Profession.

**A**NY reader who contemplates going to sea as a wireless operator may obtain authentic and up-to-date information upon the Marine Wireless Profession from the Association of Wireless and Cable Telegraphists. Applications should be made to the Secretary of the Association, at Lennox House, Norfolk Street, London, W.C. 2, and will be complied with free of charge.

### Radio Relics.

**W**HY doesn't every Radio Society start a museum? With apparatus changing its form constantly, an interesting collection could soon be formed, and it would certainly be of great interest to new members and to the general public. In addition to old-time Detectors, Condensers, Coherers, Doo-hickeys, and What-nots, a few complete sets could be included, to show us how the Rolls-Royce of five years ago compares with the Last Word of to-day.

### Mill Hill School Again.

**C**ONGRATULATIONS to Mr. Cyril Goyder, of Mill Hill School, upon his notable success in communicating with the MacMillan Arctic Expedition! In an attempt to reach the North Pole, the expedition sailed last month from Wiscasset, Maine, in the steamer "Peary" and the auxiliary schooner "Bowdoin." On board the "Bowdoin" is John L. Reinartz, the famous American amateur experimenter, and it is interesting to note that Mr. Goyder was operating a Reinartz receiver when he picked up signals from the expedition.

### Helping the Explorers.

**H**E had been tuning in to some of the American amateurs when the first signals from the Arctic came in, and these were so strong that Mr. Goyder sent out a call to the explorers. An immediate acknowledgment was received, together with an inquiry as to whether the Mill Hill station could relay some traffic to America? As Mr. Goyder thinks no more of sending a few messages to the U.S.A. than you or I do of tuning in a crystal set, he gave "Go," and took down all the greetings to friends in America that the "Bowdoin" had on hand.

### Arctic Radio.

**T**HE next day Mill Hill School was again in direct touch with the Expedition, and Captain MacMillan reported that signals from the States were only coming through to the "Bowdoin" between the hours of 7 p.m. and 8.45 p.m. The ship's position was then given as crossing the Arctic Circle, so Mr. Goyder is not only the first Britisher to get into touch with New Zealand, but he has now gained the further distinction of being the first British radio-explorer of the Arctic.

### A Soundless Gramophone.

**L**ISTENERS who marvel at the various transformations which sound undergoes whilst being broadcast, will be interested in the B.B.C.'s latest gadget.

It is an ingenious attachment for cutting out one stage in the transmission of gramophone records. Formerly these were converted into sound in the ordinary way, and picked up by the studio microphone. Now the vibrations of the needle are changed direct into electrical impulses which operate the transmitter. Consequently, when the gramophone is being "played" for wireless transmission no sound comes from it, except the gentle and familiar scratch of the needle.

### The Kentish Listening-Post.

**N**Ow that Daventry is out of hand, the B.B.C. engineering staff are concentrating upon the new Kentish receiving station. Work is already in progress there, and it is hoped that the station will be ready for service in September. Special aerials are being erected

### SHORT WAVES.

"England has easily the best method of broadcasting."—Mr. William Dubilier, "The Condenser King," reported in the "Daily Express."

"Give me a golf crowd in front of me any time and I am happy. But that microphone! Never again!"—Mr. James Barnes, the Cornish-American winner of the Open Golf Championship at Prestwick.

"Wireless, to my mind, is one of the best distractions in the world for the hospital patient; and receiving sets should be as much a part of the standard equipment of hospitals as is the operating-room or the ambulance."—Sir Bruce Bruce-Porter, interviewed by the "Daily News."

"In reflecting the aspirations and thoughts of the best elements of all sections of the community, and in bringing these aspirations and thoughts within the ken of other communities, language and race, the broadcasting medium should be able to do a very great deal to bring the nations together and to establish a basis for a conscious world citizenship."—The B.B.C., in a message to America.

"There is no likelihood of wireless telephony superseding wireless telegraphy at sea."—Senatore Marconi.

"Since the invention of Braille, there has been no greater blessing to the blind than wireless."—The annual report of the Royal Blind Asylum and School.

"We shall never be rid of the vibrato fiddle and attain the perfect broadcast singer until singers train exclusively for radio."—Mr. Joseph Lewis, musical director at the Birmingham Broadcasting Station.

"The programmes of the Broadcasting Company may leave much to desire in some respects, but they are not likely to prove more satisfactory if they are arranged and controlled by the Post Office."—"Morning Post."

"He: 'Round our little nest, darling, there will be a pretty little garden, where we can put the earth wire. There will be trees, so that we can fix up the aerial. Sweetheart.'—She (interrupting): 'I don't like wireless.' Then he slunk away with all four valves of his heart broken."—"News of the World."

for long-distance reception. Perhaps "erected" is hardly the correct way to describe them, for according to the latest report they will be of the type known as "Beveridge" aerials, which are suspended at a height of only 2 or 3 ft. from the ground.

### New Beam Stations.

**E**VERY one of the capitals of the six Australian States will be in direct wireless touch with the central beam station, linking Britain and Australia, if the

present plans materialise. One of the beams will be directed across Asia to London, and the other main "line" will reach across the Pacific to Montreal. The stations are due for completion at the end of January, and it is possible that the direct services to Great Britain and to Canada will be in working order by the end of May, 1926.

### That Chitos Circuit.

**T**HE "Chitos Novel Circuit," first published by "P.W." in August, 1924, is *novel* in more senses than one. In the first place it is stable, which is more than can be said of most supers. In the second place, L.F. can be added, which is a very welcome novelty in this class of circuit. But the most remarkable thing about the Chitos circuit is that it was *not* designed by "Mr. Chitos"—in fact, *there is no Mr. Chitos!*

### A Surprise.

**I**MUST confess that this was a complete surprise to me, especially as I had received several letters from him! But his last one clears up the mystery. Writing from 1, Lyncroft Gardens, Ealing, "Mr. Chitos" first of all tells me of the hundreds of letters he has received about his circuit from all parts of the world. After explaining that he cannot possibly answer them all, he goes on to say:

### How it Happened.

**B**Y the way, there is a slight error in your rendering of my name, which is H. G. CHILDS, not CHITOS. This error is of my own making, I am afraid, for my signature could be read as "H. G. Chitos."

"The latter name appears to be so well known in connection with the circuit that I think it would best serve your readers if you continue to refer to it under your original title, 'The Chitos Novel Circuit.'"

After the Editor had recovered from this bombshell he agreed to continue the name "Chitos," for, as he said, "It doesn't matter what you call it—it's a fine circuit!"

### Paris Time Signal.

**W**ILL the Eiffel Tower abandon its famous old time-signal, and adopt the British system instead? It is proposed that the six-dots system—familiarly known to listeners as the Six Pips from Greenwich—shall replace the present code sent out from the French station. The International Astronomical Union, which has been meeting at Cambridge, is understood to be in favour of the change, but at the time of writing the decision has not been announced.

### A Dover Ceremony.

**B**EATING RETREAT," an interesting old ceremony which is only performed by the Dover garrison, is to be broadcast from 9.0-9.30 p.m. on August 10th. The band, consisting of drums and fifes, usually marches along the parade, carrying out evolutions such as swinging the fifes over the head slowly, at the command of the drum sergeant-major.

On this occasion, in view of the possibility of rain interfering, the march will be from the Castle to the Granville Gardens, instead of the usual route to the parade.

ARIEL.

# WIRELESS and the RIFFS

THE "Genii of the Lamp" has become a reality, and is even now in the service of Abd-el Krim. This famous descendant of the race who were the creators of the fable of Aladdin and his wonderful command of a powerful and all-knowing being through the simple manipulation of a brass lamp, has himself turned to the genii of modern science, and the "lamps" of radio burn night and day, while the invisible genii "Radio Wave" flashes back and forth at the bidding of the Riffian tribesmen.

In the desperate battle against overwhelming odds which the rebellious chieftain is waging with the combined armies of the Sultan of Morocco, France, and Spain, blockading him from all contact with the outside world, Krim has found that wireless telegraphy and telephony play an all-important part in his operations. He has adopted the weapons of civilisation to fight the armies of the civilised countries.

Such at least is the story as told specially for "P.W." by the famous Danish correspondent, Alfred Roseav, who has for two months been a guest in the headquarters of the rebel leader, and watched with his own eyes the radio apparatus in operation, often under the manipulation of Abd-el Krim himself.

#### Krim's Thirty Radio Sets.

This bold Moroccan leader is not at all as pictured by the Christian world—a mad, bloodthirsty bandit riding a beautiful steed and leading a band of cut-throat Arabs to war and plunder, just for the sake of fighting. According to Mr. A. Roseav and other correspondents who have visited the Riffian armies, he has not, in fact, ridden a horse for years; and he is a well-educated man who is striving to teach the people he rules all he possibly can for their own good.

He is showing them how to read and write; arranging to have them instructed in the workings of automobiles, how to repair the engines, how to replace broken parts. He has opened flying schools, and given the Riffians the opportunity of matching their skill with that of their Occidental brethren in "chasse" and bombing work, so that the advent of the fifteen American aviators may not strike such terror into the hearts of the tribesmen as it would have a few years heretofore. He has begun to train them in the use and construction of wireless apparatus, and to have practised operators on hand to handle this modern form of communications. And in the latter he seems to find himself amply repaid for his efforts.

Radio is one of Krim's hobbies. He has approximately thirty radio sets in all, counting his transmission and receiving

apparatus, and in his own palace he has a very large set, which even Mr. Roseav, enjoying practically his full confidence, was not allowed to inspect closely. This latter set was operated night and day by four men, standing watches of six hours, and it was quite obvious that it was by means of the station that he was kept in full communication with the affairs of the outside world.

For he knew as well as the citizens of Paris what occurred in France. If the franc fluctuated slightly, due to the announce-

This thrilling and dramatic account of the use of radio by Abd-el-Krim, the famous Riff chieftain, who has won the respect of even his enemies by his heroic struggle against heavy odds, is the first ever released to the Press of the world. It confirms once and for all, in a startling manner, the vague rumours that have been floating about regarding the radio net which the rebellious subject of the Sultan of Morocco has established, and proves what a powerful ally radio may be to anyone who will call upon it for service—a veritable genii of the Arabian Nights actually brought into service by the people who, hundreds of years ago, wove tales of just such miraculous (and then unbelievable) happenings.

Alfred Roseav, the famous Danish correspondent, from whom we have received this story by special arrangement, has actually been a guest in the house of Krim for two months! He has seen daily the Riff leader and his aides working with radio sets; and while Mr. Roseav is not a technical man, his descriptions of exciting incidents in the regular routine of transmission and reception give radio telegraphy and telephony a colour and value not before realized by the layman. The following article was secured from Mr. Roseav by our Paris correspondent, M. Delano, and is exclusive to "Popular Wireless."

—THE EDITOR.

ment of an extra heavy expenditure for the Riff campaign, Krim was made aware of it either through the broadcast of the exchange rates from the big stations or by special agents placed in the various cities of the country. The arrival of the American air squadron will be no surprise to the wary old Riffian; he heard of it as soon as it appeared in the French press. He listened to the King of Spain broadcast a message to his subjects recently in which he called upon their patriotism to support the Government of Spain.

If he cannot get his information from the usual sources, his agents dotted throughout the belligerent countries can send it to him. Despite the radiogoniometric police, these sly sympathisers of the Riff cause are constantly transmitting information through the ether—either by special codes from authorised stations, or from pirate stations hidden in obscure outposts and villages of the various frontiers, or in the very heart of the big cities. Every few minutes orderlies are dashing in to Krim with bulletins and news from all parts of the world, which he scans eagerly and either notes and files or throws away.

#### The Chieftain's Personal Station.

Sometimes, says Mr. Roseav, he has seen Krim register surprise or agitation; when he will hastily turn to his own set, spin the dials, and clap on his headphones, sitting in tense listening attitude for several minutes, and perhaps making notes which he will hand to an orderly to be delivered to subordinates. As suddenly he will set aside the headphones, throw out his valve switch, and, with set properly adjusted, will resume the conversation so briskly interrupted as though nothing had happened.

His personal set, from all that could be seen of it, appeared to have twelve valves, but whether it was a combination receiving and sending set or not was hard for a layman to determine without more careful inspection. The trade-mark on it was German, and it had one large tuning dial, larger than any of the others, in the exact centre of the panel. At last the secret resolved itself. When he had tuned for several minutes, and the valves had shone either brighter or duller, according to the way he turned his rheostats, he suddenly picked up a microphone that had lain hidden on the desk and started talking.

Evidently he was giving directions to some distant outpost, as he would talk for several minutes, and then stop and go over the same routine again. Again he would pause, and then resume his orders, evidently to another station. Thus he personally



Abd-el-Krim—The Chief of the Riffs.  
(Daily Mail Photo.)

(Continued on page 1002.)

## WIRELESS AND THE RIFFS.

(Continued from page 1001.)

directed operations on his entire front as a true general, and not as a wild Bedouin horseman.

Once, while Mr. Roseav was with him, four horsemen dashed up, one of them Abdel Krim's brother (whom most of the Press photographers mistake for the chieftain himself, according to the statement of several correspondents). One of the group had his djellabah (outer garment) covered with blood, and was practically lifted from his horse and brought forward to Krim, who stood in the doorway of his palace. The latter shot two or three sharp questions at this wounded man, turned quickly on his heel, and fairly leaped to his radio set, sending out an order to bring the rider in.

### Portable Receivers in Use.

Krim, meanwhile, had clapped on the headphones, and was speaking in quick, terse sentences. He then turned to his telegraphic key, whose staccato tapping was the only sound to break the silence of the room for several minutes. As he finished, the wounded horseman was brought staggering in, and collapsed at the Riff leader's feet. Here he stayed, answering the questions which were being fairly hurled at him, between questions Krim pausing from time to time to send out short messages on his radio set.

At first it seemed as though the man were a prisoner; but from the great care taken of him after he was dismissed from the presence of the rebel general, it became obvious that he was a member of the Riffian staff. It turned out, in fact, that he was the commander of a section of Krim's regulars, who had been wounded in a desperate hand-to-hand conflict with a French outpost—a battle lasting in all for nearly four days under the torturing sun of the Moroccan plains.

The officer's horse, which seemed to be quite fresh and unhurt, was being unsaddled when Mr. Roseav drew near. On the saddle he noticed a little instrument which appeared at first sight to be a camera, but which on closer examination proved to be a radio receiving set, with headphones and a small portable aerial equipment.

### A Keen Radio Enthusiast.

There are many horsemen to be seen with the saddle sets such as the wounded officer carried. All these and the men attached to the main station being specially marked with a green ring on their uniforms in front, with a yellow cord hanging from the centre of the ring, evidently the insignia of the radio corps of the Riffian army.

Abd el Krim is always working at his set—if not in actually operating it, then in readjusting, cleaning, or repairing it. He appears to know every part intimately and to take almost a living interest in the apparatus. Once he was asked how many sets he had in all and why he had such a large aerial for his main set (for this latter is immense, with extra heavy insulators).

Krim's answer was brief and slightly evasive.

"Perhaps thirty," he said.

"Are they useful?" continued his interlocutor.

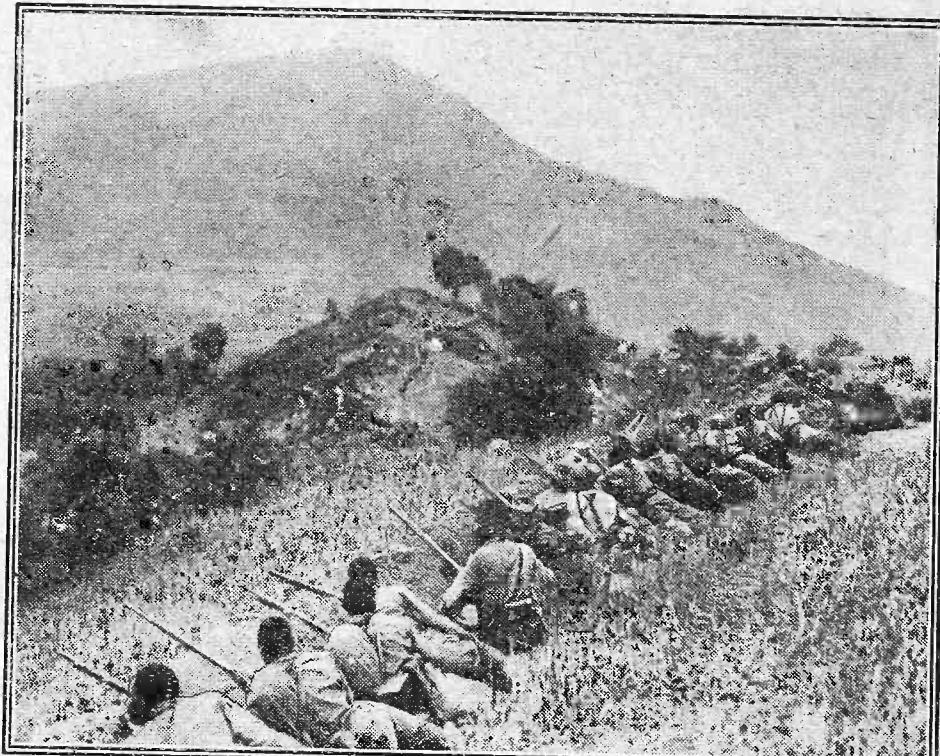
A rare smile flitted across the face of the veteran chieftain.

"Very," he answered, perhaps a trifle grimly. Then suavely: "I am tired now. I will sleep a little."

He wished to be alone. As his companions withdrew it seemed as though someone had entered the room almost on their heels from another concealed doorway. In a few

moments a woman's voice was heard gently protesting—would he not then for a little while at least leave that cold instrument of lights and wires, and rest? His answer was inaudible, but there was a click and snap of switches being thrown, a shuffling movement, then perfect quiet.

Some hours later, when people were once more allowed in his apartment, Abd el Krim was found once more bending over his radio set.



French troops entrenched on a hill overlooking Riffian outpost positions (Daily Mail Photo).

## CONTINENTAL NEWS.

From OUR PARIS CORRESPONDENT.

### Germany Two Years Behind.

THE first specially written radio-drama was broadcast in Germany last week by the Breslau station. The play, which was described on the programme as "Elfin, a Ghost Sonata," is by Rolf Gunold, who before the performance delivered a lecture on, "How to Write for Radio." It will be recalled that the first attempt of this nature was made in the United States two years ago, in England eighteen months, and in France one year ago. In some directions, therefore, Germany seems to be lagging somewhat behind the times.

### Poland Increases Number of Stations.

The Polish Government announces that it is embarking on a programme of great extension of the present radio broadcasting. New sending stations will be erected at Krakow, Lwow, Poznani, and Warsaw itself.

### German Radio Users Organise.

The associations of radio amateurs in Hamburg, Leipzig, Frankfort, Breslau, Berlin, and Königsberg, at a conference last week in Berlin, founded a National German

Radio-Users' League. It is thought that the other cities and country districts will join the new organisation, the first of its kind on a nation-wide scale in Germany.

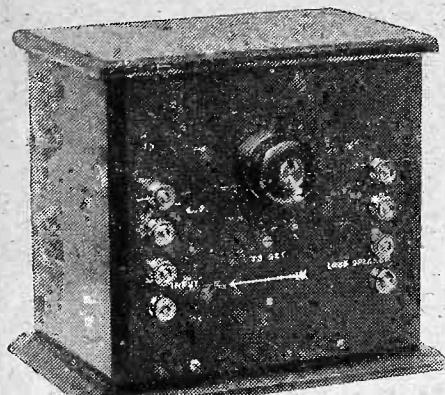
### Brussels Station May Close Down.

It is stated that, owing to the poor results obtained, the Brussels broadcasting station may close down and be transferred to Antwerp. A relay station would then be constructed in Brussels. The report, though widely current, has not yet obtained official confirmation.

### Listening-In Above the Snow Line.

The result of observations taken at varying high altitudes in the Alps in the Zermatt and Chamonix districts, of the comparative degree of clearness of European broadcasting stations gives pride of place to Zurich and Rome. Next in order comes Oslo, in Norway, which, however, proves much stronger by night than by day, a remark which also applies to the majority of English stations.

(Continued on page 1023.)



# A CONTROL UNIT FOR THE SET. FULL CONSTRUCTIONAL DETAILS.

By HAROLD H. WARWICK.

A simplified method of remote control which every owner of a valve set will find useful.

Fig. 7. The completed instrument presents a very neat appearance, as this photograph shows.

It is proposed in this article to describe a device which appears to have been strangely overlooked as a practical convenience when used in conjunction with a wireless receiving set.

The instrument is for use primarily where the loud speaker is in operation at a considerable distance from the set, and is of

since they appeared to be in perfect condition, several were purchased for a mere £1s. each. Upon testing it was found that when fairly delicately adjusted they would operate upon the quite small current of 4 milliamps., and would do so in almost any reasonable position on 8 milliamps. And since almost any valve in the last stage of a receiver takes 4 milliamps, or, if a small power valve is used, probably more, several milliamps. will be available, and this anode current is made to do the work required.

Let us first consider the relay itself, the various parts of which it is made up appearing in Fig. 4. At the back of the picture may be seen the outer cylindrical case, which is made of iron and has two screws at the open end to which the pivoting arrangement and arm shown may be fastened.

These latter may be clearly seen, and with them a disc of soft iron through which there are two holes used to counterbalance the long brass arm on the opposite side of the pivot, or to move the pivot when it is itself attracted by the magnet which is situated inside the metal case.

This magnet is created by a soft iron core wound with many turns of fine

wire to a resistance of 1,000 ohms, through which a current is passed, connections to the winding being made by soldering to the two tags which are carried through the two holes in the soft iron disc. If, then, a current is passed through the coil, the disc and arm may be moved and a contact may be made or broken by its movement.

Next let us consider the theoretical circuit of Fig. 1.

The valve  $V_1$  in conjunction with the transformer  $T_1$  represents the last stage of a receiver, and the loud speaker is shown with a theoretical version of the device under discussion.

Assume first that the whole is in operation, the filament is glowing and plate current is flowing, S and T being connected. Now, if a minimum of 4 milliamps. is flowing the contact S T will be permanently made and the set will continue to function. What will be the effect of disconnecting the loud speaker at A or B? Current will cease to flow through the winding W, S and T will break, and filament current will cease to flow, thus the set will be switched off completely and will not again function until S and T are closed. It should be noted that reconnecting the loud speaker will not effect this, since the filament must be alight before plate current can flow.

#### A Simple Solution.

It was decided to make up the arrangement in practical form, but one difficulty was encountered, namely, to find a means whereby the somewhat rough brass arm

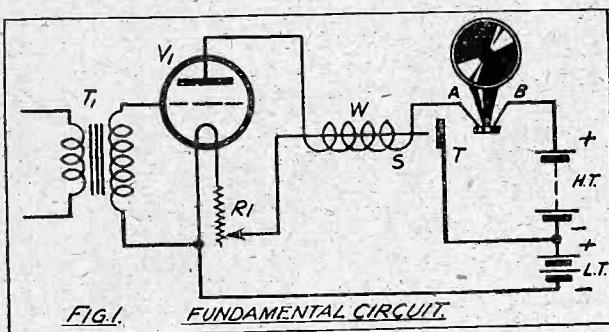


FIG. 1. FUNDAMENTAL CIRCUIT.

such a nature that the set may be completely switched off by simply disconnecting one of the loud speaker leads, there being no further wires than these required. This is, therefore, nothing more nor less than a distant control.

#### A Cheap Relay.

It would, perhaps, be as well to describe how the idea originated. Upon looking over some ex-government stock some small instruments were discovered which were being sold as chokes with an ohmic resistance of 1,000. An inquiry revealed the fact that these so-called chokes were part of ex-government trench telephone switchboards and were in reality relays, and,

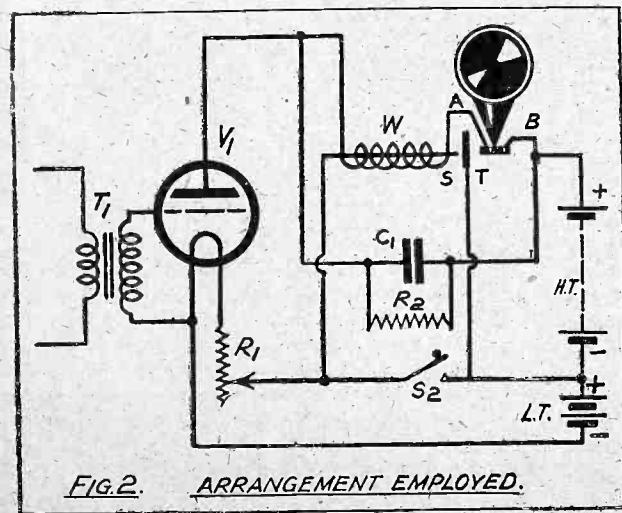
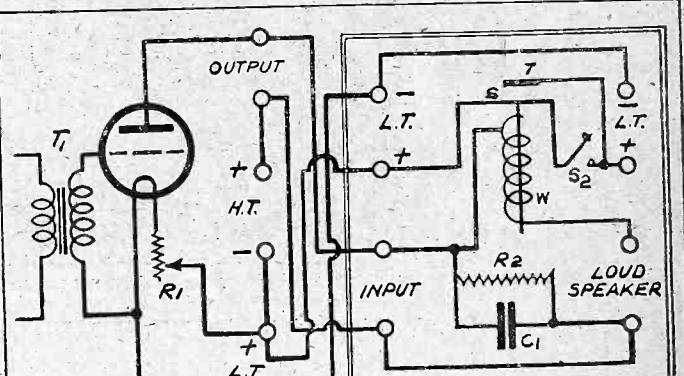


FIG. 2. ARRANGEMENT EMPLOYED.



WIRING OF UNIT & CONNECTIONS TO RECEIVER. FIG. 3.

could be made to make contact with another metallic part in order to pass sufficient current for the valves smoothly and without crackling. A mercury cup was the solution to the problem and consisted merely of a brass crystal cup which was held in position by an ordinary spade terminal screwed into the panel. This may be seen at the back of Fig. 4.

Furthermore, since variable smoothing devices are not often incorporated in sets, a clip-in high resistance and a clip-in condenser were provided for shunting across the loud speaker, the best values being found by experiment. The circuit diagram of the final arrangement appears in Fig. 2 when wired to a receiver, and Fig. 3 shows the actual wiring of the unit itself.

It will be noticed that a switch,  $S_2$ , is incorporated and this is used to turn the set

(Continued on page 1004.)

## A CONTROL UNIT FOR THE SET.

(Continued from page 1003.)

on again; if closed only momentarily current will flow in the filament circuit and consequently in the plate circuit. As soon as this happens the relay closes the circuit and the switch may be opened.

### Position of the Relay.

The front and rear of panel lay-outs will be readily appreciated from the photographs; on the front appear only the switch referred to and eight terminals, four down each side, while upon the back all the

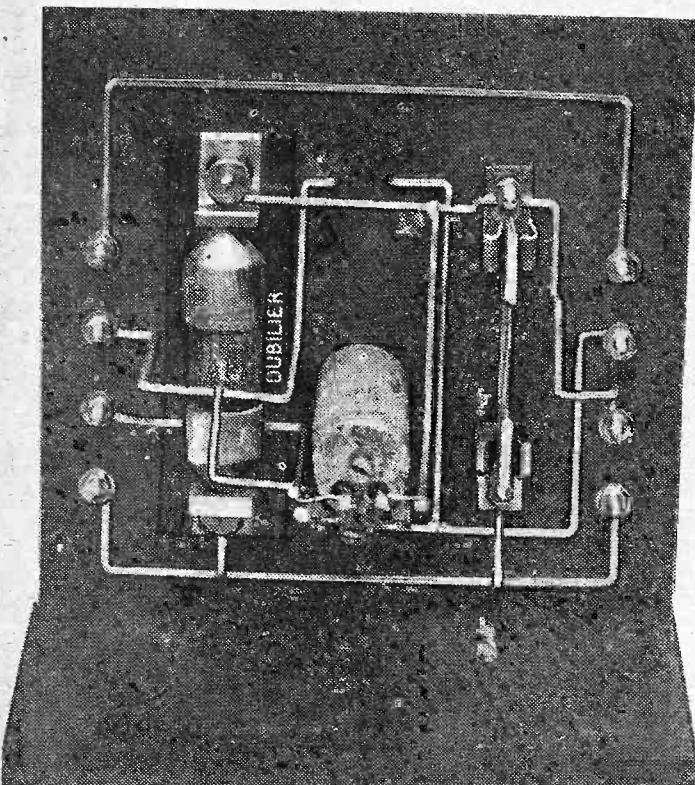


Fig. 5. The back-of-panel wiring. On the right is the fixed condenser, and on the left the Dubilier resistance.

remaining parts are fixed. None of the positions is critical in any way, and if the parts are placed in a manner approximating to that shown no difficulty should be experienced. The position of the relay should be carefully noted, for it is in an upside-down position, and the end of the moving arm is bent down at right angles so that it reaches to just below the surface of the cup. Care must be taken that when the panel is in a vertical position the arm is just in an up position, so that when the disc is pulled the arm will descend into the cup and make contact with the small amount of mercury which should be placed therein.

The parts required are as follow:

- One piece of ebonite, 6" x 6" x  $\frac{1}{4}$ ".
- One make-and-break switch.
- One ex-government "choke," as described.
- One fixed resistance. Suggested value, 100,000 ohms (Dubilier).
- One clip-in condenser. Suggested value, .006 mfd. (McMichael).
- Eight terminals.
- One spade terminal.
- One crystal cup.

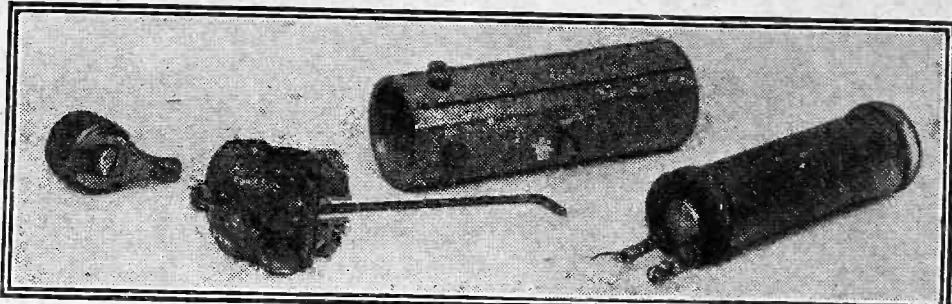


Fig. 4. The relay dismantled to show its separate parts. On the extreme left is the mercury cup.

### Panel transfers, if required.

Small amount of mercury, also sundry wire, screws, etc.

The values for the resistance and condenser given above are those which generally prove suitable for most loud speakers, but it should be remembered that where a fixed condenser is already incorporated in a set the additional .006 mfd. may, and probably will, be found too great. As there are many so-called chokes about at the present time no difficulty should be experienced in obtaining one from one of the big disposal stores for ex-army stock.

On this instrument the wiring should be particularly simple, as every connection may be clearly followed in Figs. 5 and 6, soldering being performed where no nuts are available, and every care being taken to make the nuts really tight.

When the panel has been screwed to the baseboard and the relay has been delicately adjusted so that the arm is in an up position and just above the mercury in the cup, the terminals on the left should be connected to the set and those on the right to the accumulator and loud speaker. The high-tension battery is connected to the set in the usual way. If the switch on the front is now depressed the filaments should light and should remain so when the switch is opened.

### Not Affected by Vibration.

The way to switch off is to remove one of the loud-speaker connections. It is not recommended that more than two amps. be passed through the relay contacts, as the area of contact may be inadequate to deal with more.

If the above details are observed there is only one possible and likely occurrence which may cause the device to be inoperative, and that will be due to the wrong connections being made between the telephone terminals of the set and the input of the unit. Reversing these connections will immediately rectify the matter, but it is, of course, necessary to touch the control after adjustment as little as possible in order to preserve a satisfactory state of affairs, and this may best be done by placing in some remote part of the bench or table and letting well alone. Vibration will not seriously affect matters, but the relay itself must be kept in the same initial horizontal position.

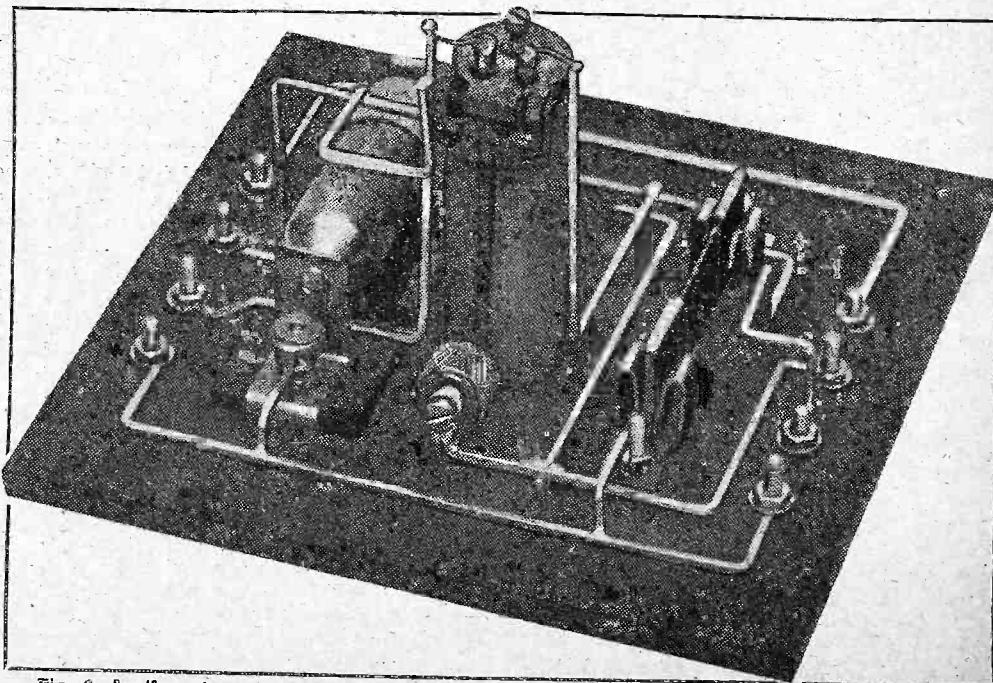


Fig. 6. Another view of the wiring, showing clearly the connections to the mercury cup and the relay.

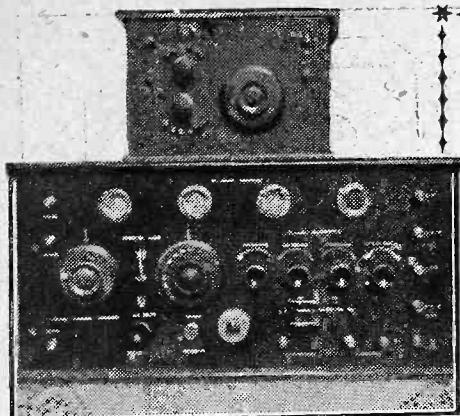
# PRACTICAL RADIO EXPERIMENTS.

## SOME INTERESTING IDEAS FOR "P.W." READERS.

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

(Technical Editor "Popular Wireless.")

There are many ingenious ways of conducting useful and amusing Radio experiments in the home. Mr. Dowding outlines a few experiments of his own which should appeal to "P.W." readers.



The "P.W." Long Range Loud-Speaker Set made by Mr. C. W. Tuck, of 40, The Crescent, St. James' Street, Walthamstow.

In ordinary circumstances standard wireless equipment, within the limits of its present state of perfection, answers most purposes perfectly satisfactorily, but at the same time there is plenty of scope for the invention of novel arrangements and adaptations.

That there is room for big improvements as well is obvious, but the average con-

structor cannot afford the time or the money to carry out the research work which is an essential prelude to really great inventions and discoveries.

Fig. 1 indicates a rather interesting 'phone or loud speaker extension arrangement which makes use of the house electric light system. The receiving set is installed in any convenient room, and a connection made between its telephone terminals and the electric light pendant or chandelier by means of an ordinary plug adapter. Tele-

phone receivers or loud speakers can then be "plugged in" in any of the other electric light sockets in the house, and perfect reception is obtained by that means.

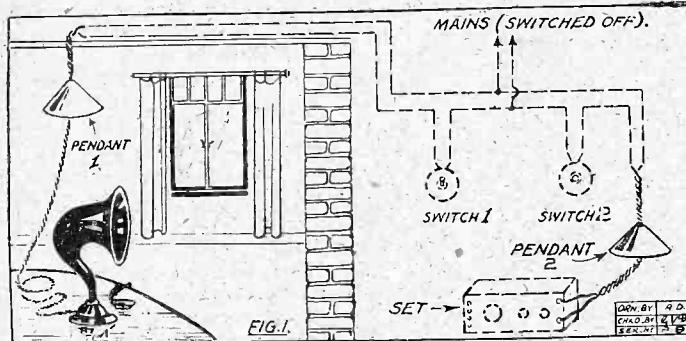
The limitations of the arrangement in its present form, although possibly they can be overcome, are that it can only be brought into use where the electric light is not required for illuminating purposes, and when all but certain switches in the house are in "off" positions.

To the set itself, whether it be crystal or valve, a choke attachment, as at Fig. 1a, must be connected. It can consist of an iron core choke of two or three thousand ohms resistance, or the secondary of an L.F. transformer, to which should be connected two .01 mfd. fixed condensers as shown. The local switch controlling the socket into which the adapter is plugged should be switched on, and other bulbs it lights, if any, should be removed.

The switch controlling the mains, which is generally situated near the meter, should be switched off. Every pair of telephones and every loud speaker to be used must be provided with an attachment consisting of two .01 mfd. fixed condensers, as shown in Fig. 1b. Similarly to the receiver end of the wiring the switch controlling the socket into which 'phone adapters are plugged must be switched "on," and any bulbs which light with it removed.

### Dispensing With the Lead-in.

The whole scheme is much more spectacular than it is really useful, although during afternoon transmissions it is very nice to be able to wander around the house plugging in and listening in just where the fancy dictates. Also, of course, it causes considerable mystification among friends, who can be made to regard a house in which the system is used as something rather wonderful.



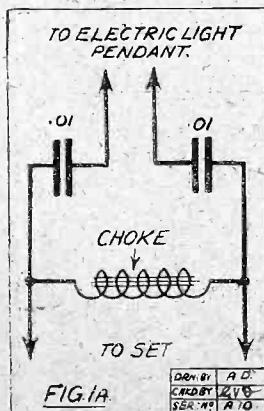
structor cannot afford the time or the money to carry out the research work which is an essential prelude to really great inventions and discoveries.

### Novel 'Phone Distributor.

Nevertheless, it must not be overlooked that any constructor who takes a really keen interest in wireless, and who is always endeavouring to improve his set, or trying to arrange something original and interesting in connection with his installation or operation, might at any time suddenly hit a "brain-wave" that would put him on the road to fame and fortune.

Quite apart from such rather remote possibilities, however, inventive "wangling" is an absorbingly interesting, and in order to prove the infinite scope available in a comparatively new science such as wireless, I will give in detail the outlines of a few of the many schemes I have at one time or another successfully employed.

In some cases they proved really useful, while in others merely spectacular and amusing.



The next scheme, Fig. 2, is of a distinctly more useful nature. By means of a couple of small boxes fixed on the window frame, one inside and one outside, the aerial and earth system is completely isolated from the interior of the house, and no wires pass into it whatsoever. The necessity for a lead-in tube is removed, and the risk of damage to the set by lightning is completely eliminated.

### Preparing the Coils.

Briefly the idea is as follows. Aperiodic aerial tuning is employed, and the coil in the open or aerial circuit is outside the window, but inductively coupled to a coil inside. This latter is directly included in the circuit of the receiving apparatus itself. This method is perfectly efficient—more efficient in point of selectivity than the standard single tuning circuit, and the glass intervening between the coils does not appear to make the slightest difference, providing certain important details are borne in mind.

For instance, the coupling between the coils must be a fairly close one, and the space between them should not exceed  $\frac{1}{4}$  inch, including the thickness of the glass.

The two coils should be cylindrically wound and arranged so that they are in line end to end, as per Fig. 2 and Fig. 2b.

The outside coil can consist of 25 turns of 20-gauge wire wound on a 3-in. former. It should be totally enclosed in a hard wooden box fitted with two external terminals for aerial and earth. Across these should be connected a lightning arrester.

That side of the box which will be closest to the window pane should be of very thin wood, or better still,  $\frac{1}{16}$ -in. fibre. After assembly the box should be covered with two or three coats of good enamel or paint to render it quite weather-proof. A bracket should be arranged to securely fix the device in position.

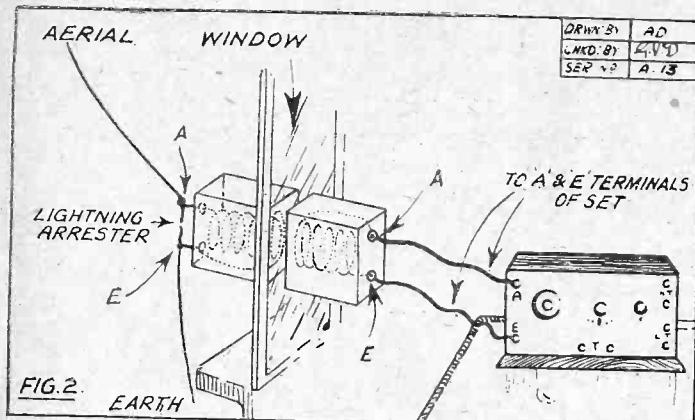
The coil inside should be wound on a 3 in. diameter former. For normal broadcasting 75 turns will suffice, with a .0005 mfd. variable condenser across it for tuning purposes. Reaction on to this coil can be arranged quite easily, either by means of a 2-in. rotor wound with 100 turns of 30-gauge wire, or a coil of

(Continued on page 1008.)

## PRACTICAL RADIO EXPERIMENTS.

(Continued from page 1005.)

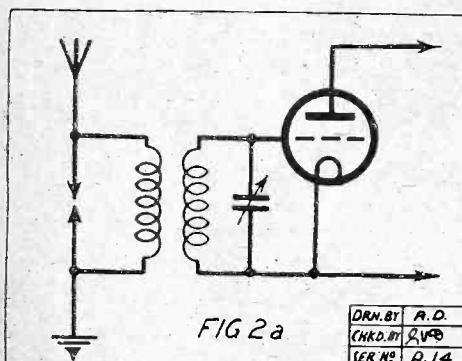
70 or so on a  $2\frac{1}{2}$ -in. former sliding into the larger coil. In the case of a set with one or more stages of H.F., intervalve reaction should be employed. The direction in which



the two aerial coupling coils is wound will not be found to be important.

### Easily Added H.F. Amplification.

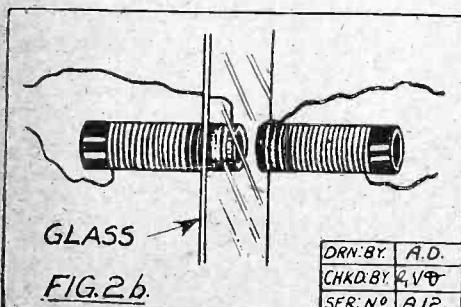
A method of rapidly converting the "household" receiver which is left "set" on the local station into a "DX" receiver with a stage of H.F., is as follows (Fig. 3),



and in its simplicity and effectiveness it is rather unique.

The main set, which can be a crystal, one valve, or crystal or valve with any number of L.F.'s for loud-speaker work, is arranged so that its aerial tuning coil is wound like a frame aerial in its lid, or immediately beneath its lid—the enclosed cabinet type of lay-out being employed. The coil should be wound for normal broadcasting, and if required a plug-in point arranged for loading purposes.

The H.F. unit using a dull emitter, and with all its batteries enclosed in its case, has a coil wound around just inside the base of its cabinet, the circuit being as in Fig. 3a.



Therefore, all that it is necessary to do to bring the H.F. stage into use is to stand the H.F. unit on the top of the main set, and to shift the aerial and earth connections from the latter to the former. The aerial coil of the main set then acts as an H.F. transformer secondary, the intervening wood in no way interfering with the operation of the circuit. Possibly some constructors would prefer to have the H.F. stage incorporated in the "household" with a switch to place it out of action, but on the other hand it is decidedly advantageous to have the "household" set as compact and "footproof" as possible.

Should reaction be desired, and in many cases it will be, the coils should be wound in the form of large "baskets," or "spiders," and a variable coupling with the "aerial" coil in the main set arranged on the lines of Fig. 3b.

Fig. 4 gives the essentials of what is entirely a "stunt" arrangement. With the assistance of quite a small gadget the effect is to make it possible to switch a set on by word of command. For instance, the operator approaches the set and asks for "A little music, please," and the receiver immediately begins to function. At any time after that he can order the set to "close down, please," and the music or speech stops. The above can be repeated "ad infinitum."

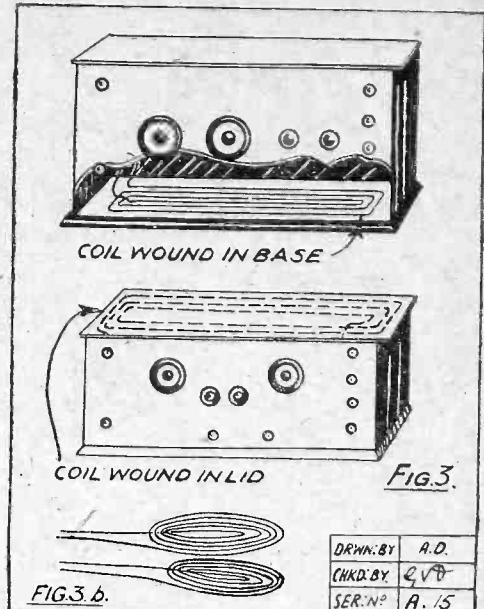
Very mysterious and all that, but no great call on science is made to achieve those startling results. Refer to Fig. 4. It will be seen that the filament circuit is made or broken by the balanced arm A, falling on either E or D. Two small funnels arranged behind "valve windows" are directed on flat metal plates attached to the arm A, which is balanced but confined in movement by points E and D.

### Distant Control.

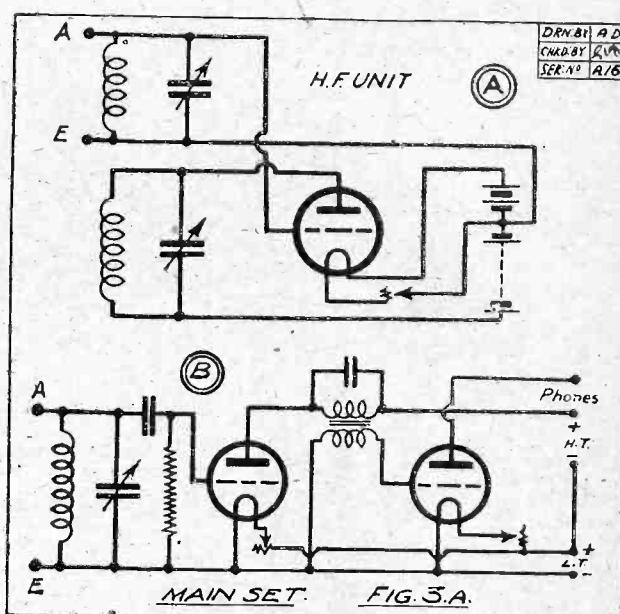
Of course, it is quite a "wangle," for it is necessary to blow down funnel B to switch off. Therefore the operator's words must conceal discreet "blows," but these need not be at all powerful if the arm is balanced nicely. A shutter arranged behind the panel can cover funnel C to prevent strong draughts "blowing" the set on during long periods of "off duty."

A relay, of course, is advisable, and would be more scientific, but I have found the light contact provided by the simple apparatus described all that is necessary when it is properly arranged, but silver contact points should be employed.

As a matter of fact, I had little devices of this nature fitted up for some time in several rooms supplied with extra extension leads. The receiver was always left "set" for the local station, and a word of command in any of the rooms so fitted

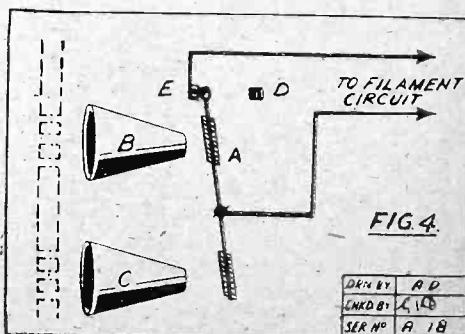


provided or stopped the music from concealed loud speakers. The amusement and mystification caused among friends was considerable, although by now most of them expect things like this when they visit me.



Did space permit, I would like to describe some of the other-than-wireless "stunts" I have amused myself and others by installing.

The point I wish in conclusion to emphasise, however, is that such "stunts" are not waste of time. They educate, sharpen the imagination and increase one's enthusiasm, and anything that does any one of these things is very much well worth while.



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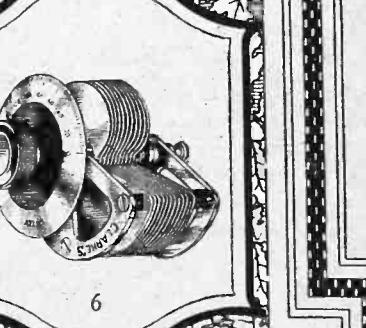
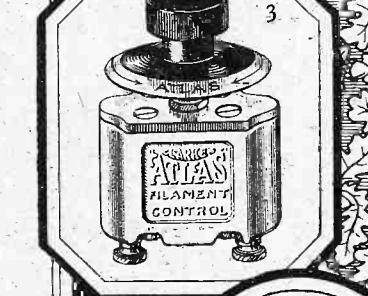
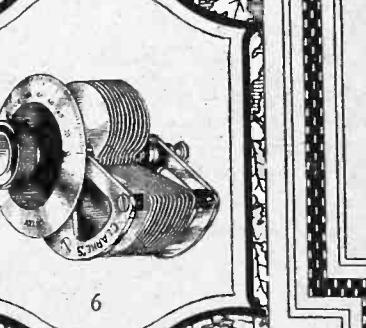
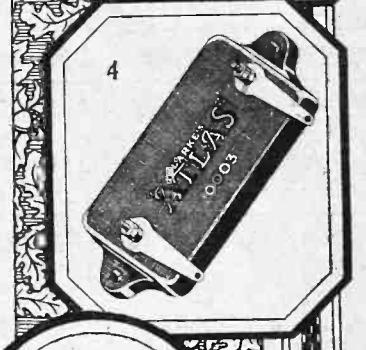
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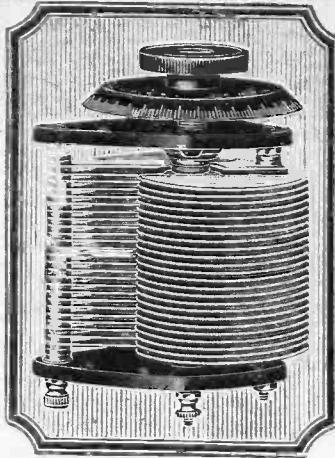
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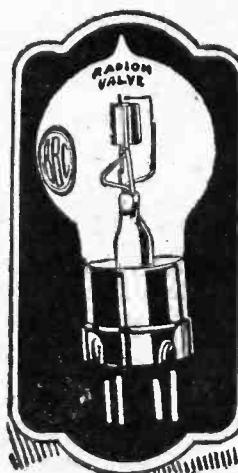
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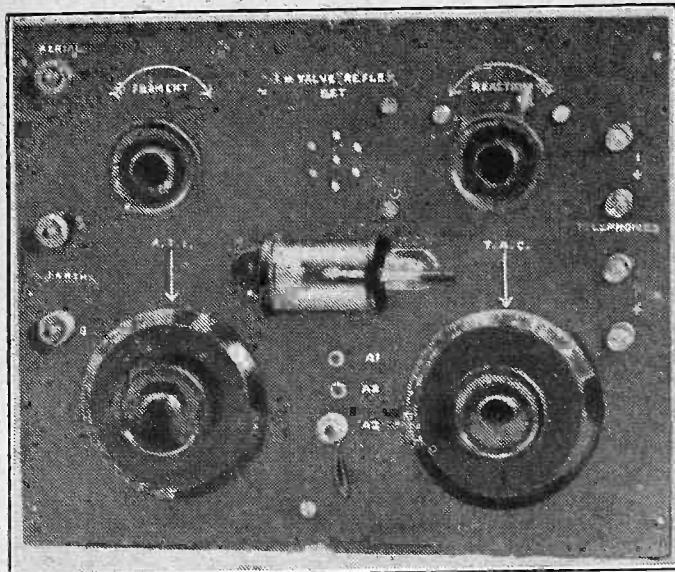
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A valve-crystal reflex set built by Mr. W. Ment, of 30, South Hill Road, Hemel Hempstead, Herts.

NOT very long ago I endeavoured to show that a wireless crystal of good sensitivity remained unaffected by the action of greases and oils of reasonable purity, and that very thin layers of grease on the surface of a crystal would benefit the reception obtained from it rather than anything else owing to the greater ease with which the cat's-whisker could be adjusted on the crystal surface, and also because of the fact that the grease film prevents the crystal from becoming dulled by the action of the air.

It was also observed that very little harm was afforded to a sensitive crystal when it was handled by persons possessing reasonably clean hands.

In addition to these points, however, there are several other facts concerning the science of crystal rectification and reception which it is proposed to deal with in this article. Many of us who are particularly interested in crystal reception are apt to get fixed ideas into our heads concerning the crystal and its radio technique without questioning to any great extent the validity of the supposed facts. The grease on crystals fallacy, which has to-day obtained such a great hold on the crystal listener-in, may be cited as a striking confirmation of this fact. However, apart from this, there are other features concerning the art of crystal set working which are worth discussing in some detail.

#### Cat's-whisker Variations.

Many amateurs find the choice of a cat's-whisker for use with their crystal to be a rather vexing question, especially as so much is written on the influence of various metallic contacts on the reception obtained from ordinary natural or artificial galena crystals.

The facts, however, of the matter are these: Provided you are working with a good sensitive crystal, one of the advertised brands of wireless crystals for instance, it is very improbable that you will be able to detect any difference in reception occurring from the use of cat's-whisker contacts which are made out of metals or alloys having a normal electrical resistance. Or rather, it should be said that no difference in reception will be detected providing the cat's-whisker used is in a fresh and clean con-

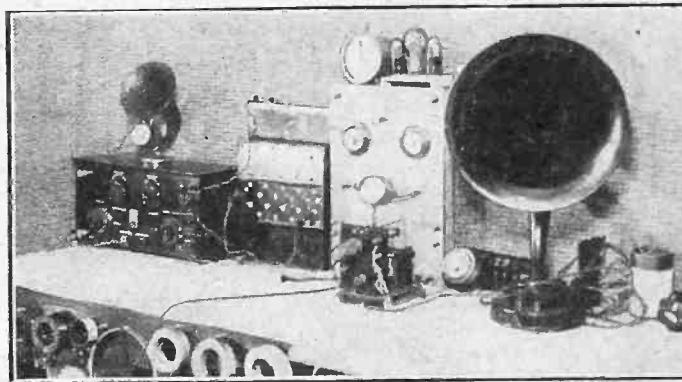
dition. With sensitive micro-ammeters it is possible to detect slight differences in the rectified current, but these have generally no appreciable effect upon the reception given by the set.

And yet, in ordinary working with crystal sets, it is a well-known and a practically established fact that cat's-whiskers composed of certain metals or alloys do, in the long run, give better results than others, and accordingly the metal itself is considered to be directly responsible for the efficiency or otherwise of the reception.

#### Interesting Experiments.

Careful trials with freshly prepared cat's whiskers, however, will prove that this assumption is in the nature of a fallacy. It is only when the surface of the cat's-whisker becomes covered with a thin film of tarnish and oxidation products that the reception decreases in strength.

The "noble metals," such as gold and platinum, and also various kinds of non-corrodible alloys are therefore favoured by the amateur for cat's-whisker construction,



Part of the experimental station belonging to Mr. W. A. Agnew, 14, Garry Street, Cathead, Glasgow.

because they do not oxidise or tarnish when they are exposed to impure atmospheres, and therefore they are able to function satisfactorily at all times. Copper and brass, on the other hand, and metals such as lead, zinc, tin, and silver very rapidly tarnish in ordinary atmospheres, and therefore although they give good results at first when employed as cat's-whiskers in a crystal set, the efficiency of the reception soon diminishes owing to the tarnishing of the metal.

But why does a tarnished cat's-whisker result in decreased strength of reception?

## SOME CRYSTAL FALLACIES.

By J. F. CORRIGAN,  
M.Sc., A.I.C.

(Staff Consultant to  
"Popular Wireless.")

The idea which is usually accepted on this matter is that the minute film of tarnish offers an exceedingly high resistance to the flow of the high-frequency currents entering the detector, and thus the strength of the rectified current is weakened.

This assertion is incorrect, however, for actual tests have shown that the current is able to pass across a very thin film of tarnish such as is deposited on the surface of a cat's-whisker in ordinary use with practically no diminution in strength. It is more likely that the tarnished cat's-whisker acts in a detrimental manner to the signal strength by altering the actual nature of the crystal contact so that a contact of weakened rectifying powers is set up.

#### Effect of Heat on Crystals.

Thus a silver contact employed with an ordinary galena crystal works exceedingly well at first, but, in time, the silver point becomes covered with a brownish film of silver sulphide. Now, at this stage, the rectifying contact is not a silver-galena one, but a silver sulphide-galena contact. Silver sulphide is itself a bad rectifier, and thus the current strength in the 'phones is appreciably diminished.

The effects of heat on crystals are responsible for many misunderstandings on the part of crystal enthusiasts.

We are all told that a crystal should on no account be subjected to any degree of temperature if its sensitive condition is to be preserved unheated. There is a certain amount of truth in this statement, of course, but nevertheless the statement does not embody a comprehensive or universal law.

Carborundum, for instance, works best when it is heated to a temperature of upwards of 400 deg. Cent. Silicon and zincite can also be similarly heated without suffering any ill-effect during the process.

In the case of galena, the mineral of which most of the ordinary crystals of commerce are composed, the matter is different. Some galena crystals, particularly those of the fine-grained type, can be heated to surprisingly high temperatures without undergoing any detrimental change, so far as sensitive properties are concerned. On the other hand, there are galena crystals which seem to decrease in sensitivity when heated to much lower temperatures.

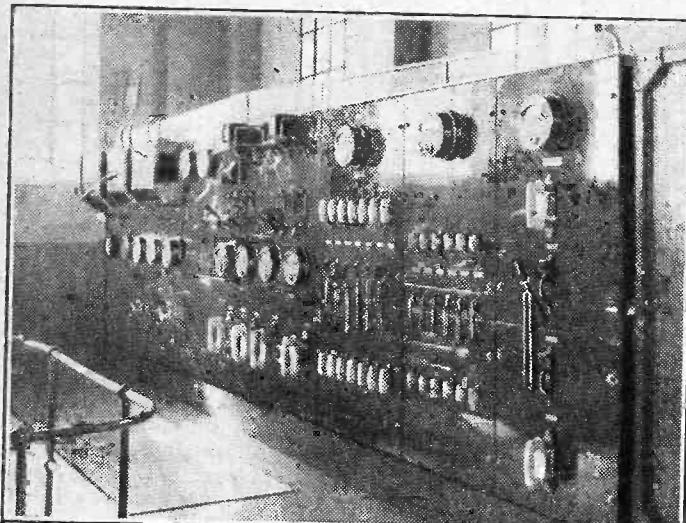
Fortunately, however, these crystals are not very abundant. A crystal can be quite safely cemented in its cup by means of Wood's metal or even with alloys of considerably higher melting-points. There is little point in using low-temperature melting alloys for the cementing of crystals such as silicon, zincite, carborundum, and bornite, for these minerals will easily stand the heat of molten solder.

(Continued on page 1010.)

## SOME CRYSTAL FALLACIES.

(Continued from page 1009.)

Taking these facts into consideration, therefore, it will become obvious that there is not much to be gained by the use of extremely low-temperature melting alloys, and plastic metals. They only afford an indifferent contact and they offer a much greater resistance to the rectified current than does a metal or alloy which sets more



The main switchboard at the Rugby station.

firmly. With one or two crystals, notably tellurium, it becomes necessary to employ a low-temperature melting alloy for cementing them in their cups; not, however, because the heat of ordinary molten solder has any direct effect upon their radio sensitivity, but on account of the fact that these crystals melt at about the same temperature as solder does.

It is a mistake to suppose that the act of scraping a crystal surface with a knife will renew the sensitivity of the mineral. Scraping abrades the surface of the crystal, and, in the great majority of cases, this surface abrasion tends to further diminish rather than to increase the crystal's sensitivity.

Fresh sensitive areas in natural crystals, it is true, may very often be laid bare by very carefully chipping at the crystal surface with the point of a small knife. In this case, the surface of the crystal breaks up according to its natural laws of cleavage and therefore the freshly exposed surface represents one which possesses its characteristic facets and other physical properties, and which is therefore able to rectify in very much the same manner as the old crystal surface did.

### Sensitivity of Detectors.

There are some crystals, such as molybdenite, whose surface may be peeled off in layers, and by very carefully removing an old layer from the piece of mineral a newly sensitive one may be exposed. Scraping, or even gently chipping of the crystal surface is in this case no remedy for decreased sensitivity.

Finally, we come to the question as to

what may be considered to be the practical resultant of a good sensitive crystal or crystal combination. Are the practical working results of a crystal to be judged by the range over which it will operate, or the actual signal strength which it produces?

To make this point a little clearer. The normal practical working range of a crystal is about ten to twelve miles, or perhaps sometimes a little more, from a main B.B.C. station. That is to say, at these distances a crystal, when it is incorporated into a reasonably efficient receiving set, may be expected to give good clear signals in the phones.

Such a crystal is said to be a sensitive one.

But still, there are a lot of mistaken ideas over the meaning of the word sensitivity as applied to crystal reception.

Suppose we imagine two crystal set owners each provided with two crystal detectors, one of which is an ordinary cat's-whisker-galena one, the other being an instrument of the perikon type employing, let us say, a combination of zincite and tellurium. Amateur Number 1 lives at a distance of two miles from a main broadcasting station. Amateur Number 2 resides almost 15 miles away from the transmitting aerial. The near-by crystal set owner will get louder results by the use of his perikon detector (providing the combination has been carefully selected) than he will with his more usual cat's-whisker type of detector. He will, therefore, be inclined to think that the perikon detector is the more sensitive of the two.

### Perikon v. Galena.

On the other hand, the case with crystal set owner Number 2 will be exactly the opposite. His perikon detector will give

very bad results indeed, whilst if he has procured a good sample of galena, and has carefully adjusted it, his cat's-whisker-detector will give fairly satisfactory results. To him, therefore, the galena detector will be infinitely more sensitive than the perikon combination.

From this line of reasoning, which is based on actual experiment, it follows therefore that a crystal may have two kinds of "sensitivity," a loudness-sensitivity and a distance-sensitivity. An ordinary cat's-whisker crystal has a very great distance-sensitivity and a fairly good loudness-sensitivity. On the other hand, a good perikon combination of crystals, although it may have a poor distance-sensitivity, possesses an extremely good loudness-sensitivity.

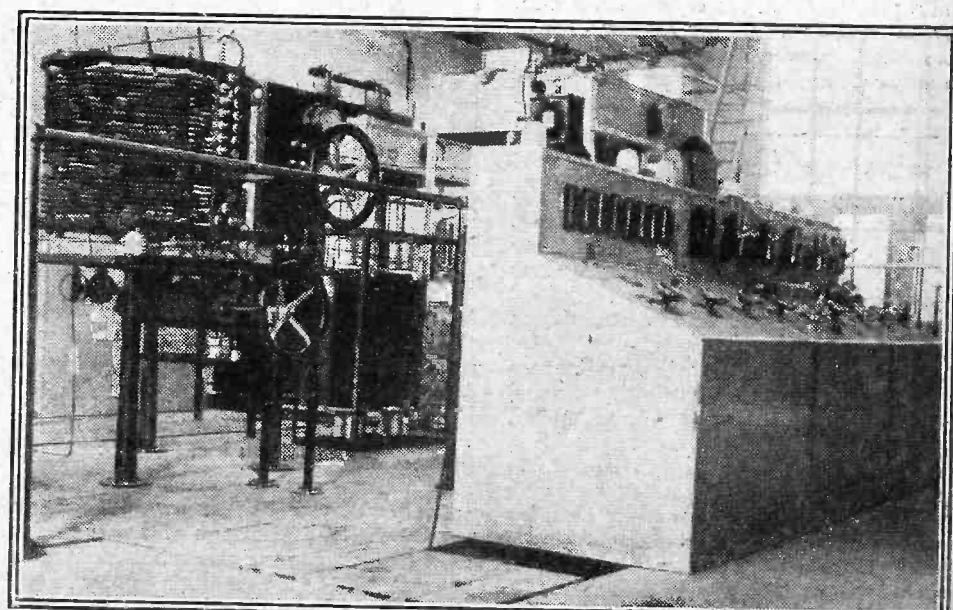
### Advantage of Stability.

In fact, it is only because difficulty is experienced in commercially marketing perikon crystals with standardised rectifying powers that the perikon type of detector is so seldom to be seen on the panel of the family crystal set situated within close ranges of a broadcasting station. When operated by signals of strong initial intensity, a good perikon crystal combination will give signals of greater strength than the average galena crystal combination.

However, the latter crystal has the advantage of producing signals of satisfactory clarity over much longer ranges than the perikon combination, and on account of this fact it has come very greatly into prominence.

Nevertheless, as I have just remarked, if the crystal set user could only realise the greater freedom from little annoyances (such as adjusting the cat's-whisker, and so on) which is gained by the use of a combination detector employing carefully selected crystals, there would be a greater number of perikon detectors seen on the radio market than there are at present.

Of course, as an all-round efficient rectifying crystal, a piece of galena of a well-known advertised brand cannot be beaten, but for loudness of reception combined with permanence and reliability give me a perikon combination of carefully selected crystals every time.



This photograph shows the main control table and aerial tuner at the high-power station at Daventry.

# Wireless in the Air Force

**WIRELESS** in the Royal Air Force only dates from the first year of the war, and in the passenger-carrying civilian aircraft from the first year in the peace after the war. Flying in its early years developed more rapidly than wireless in flying machines. The reason for this has been the peculiar difficulties from the radio viewpoint inherent in the construction of flying machines and the conditions of flight.

It is necessary, for example, to have extreme lightness in order not to diminish the useful load; the intense noise of the aeroplane engines has presented an obstacle to the more rapid development of wireless;

A Special Article  
of Interest to all Readers.

By  
**Lieut.-Commander The Hon. J. M.  
KENWORTHY, R.N., M.P.**

at a distance of 100 miles. The wavelengths used vary from 400 to 1,200 metres. All commercial aircraft on organised routes now carry wireless. The aerials are either payed out astern from a drum, or are fixed round the frame of the machine as circum-

It is also necessary for the aeroplanes to be able to report any difficulties experienced to the ground stations, and it has been found necessary to establish a service of communications between passengers and the arrival stations, in order to communicate times of reaching destination, business information, and so on.

#### For Fighting Purposes.

And finally, wireless is used for indicating to a machine in flight its exact position in the air. This can be done either by the machine making a spark and the bearing obtained from this by directional wireless from the ground station, which is afterwards signalled to the machine; or by the ground station making a spark, the direction of which is taken by a bearing instrument in the aeroplane.

The latter system requires more complicated apparatus, but it has an advantage in war machines, in that they need not give away their position by unnecessary spark emissions. For if it is possible for friends to tell the bearing of a machine from the ground, it is equally possible for enemies to do the same.

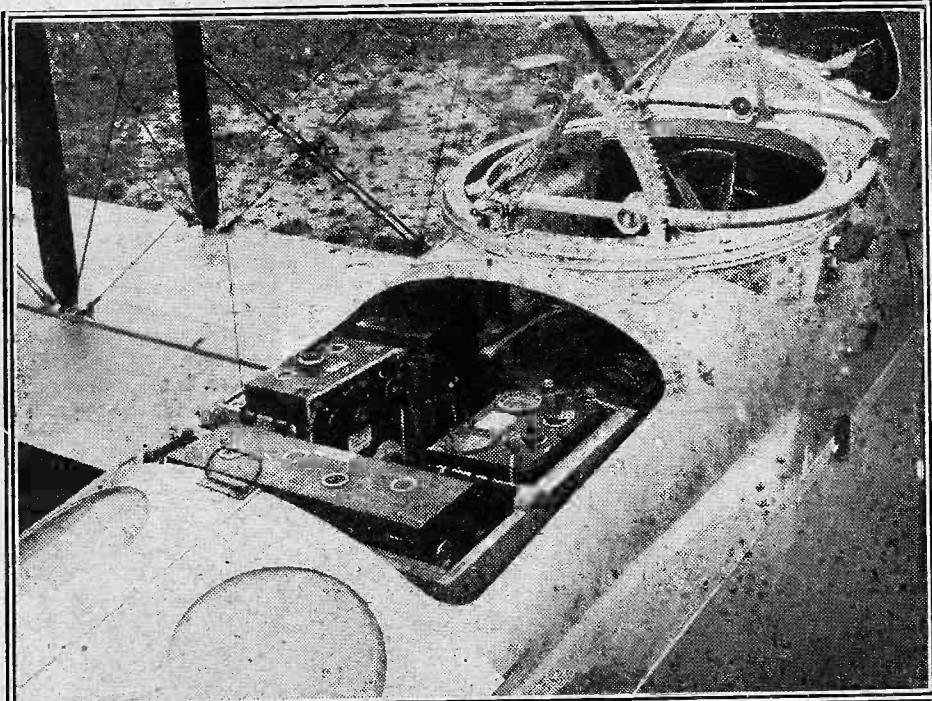
Now, the requirements of war machines are rather different. With the development of air tactics fighting machines are now organised to fly in numbers and in formation. For fighting purposes this is essential. It is necessary for the leader of a formation in flight to be able to communicate instructions and orders quickly to his colleagues, and this is done very successfully by wireless telephony, using, of course, code words to transmit various messages and orders. The principal need, therefore, of the fighting machines is an apparatus which will enable communications to be kept up between machines flying in the same group, and only the leader requires means of signalling to and from the ground.

#### Artillery Observation.

But for scouting purposes, both by land and by sea, a different apparatus is required. The need here is to be able to transmit information over as long a distance as possible to the ground station or flagship. Thus aircraft co-operating with the Navy have their efficiency greatly increased as scouts by being able to communicate information as to the enemy's movements when seen from the air to the admiral's flagship, or to the advanced cruiser scouts.

Another very important use of aircraft in war, both on land and sea, is in spotting, or observing and correcting the fire of the

(Continued on page 1012.)



The latest type of wireless gear fitted to a modern aeroplane.

telephony, and it has been difficult to fit wireless instruments into the crowded cockpits of aeroplanes. This last trouble has been largely got over with remote control by a system of Bowden wires.

#### Two Distinct Problems.

Recent progress has been rapid. Conversations have been carried on by wireless between aeroplanes and ground stations over a distance of 400 miles, using sets rated at only 100 watts. Aeroplanes in flight have communicated with each other at distances of 50 miles, and on one occasion

stances dictate; while for distant expeditions over the desert, and so on, emergency fittings are carried with a telescopic mast which can be used for supporting an aerial when signalling from the ground.

There are two distinct problems in wireless for aircraft. Take first of all the requirements of civil aviation. It is necessary for the ground stations to be able to send actual weather forecasts and reports to the machines in flight. The greatest enemy of the flying man is fog, and it is necessary for him to have early notice of fog banks.

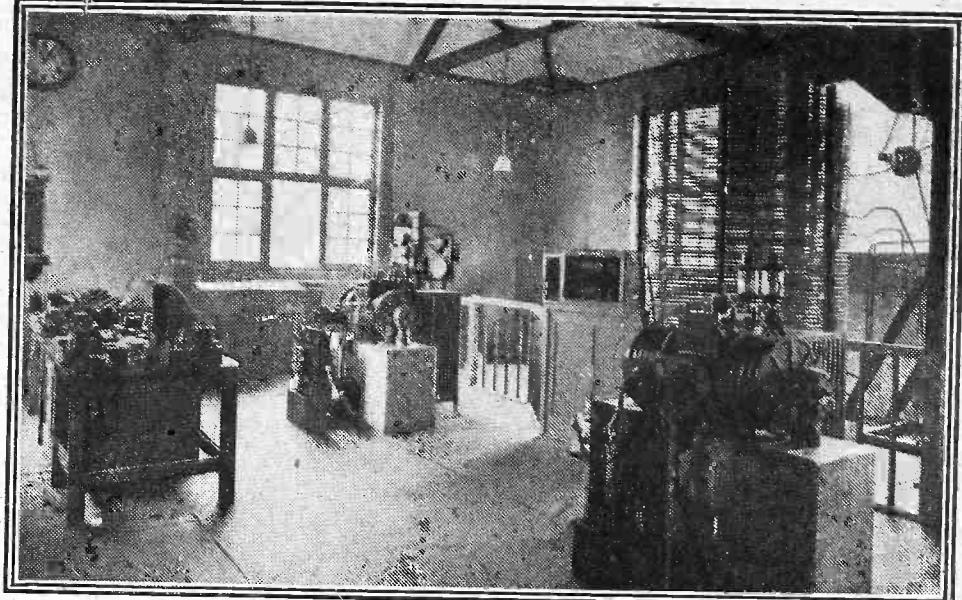
## WIRELESS IN THE AIR FORCE.

*(Continued from page 1011.)*

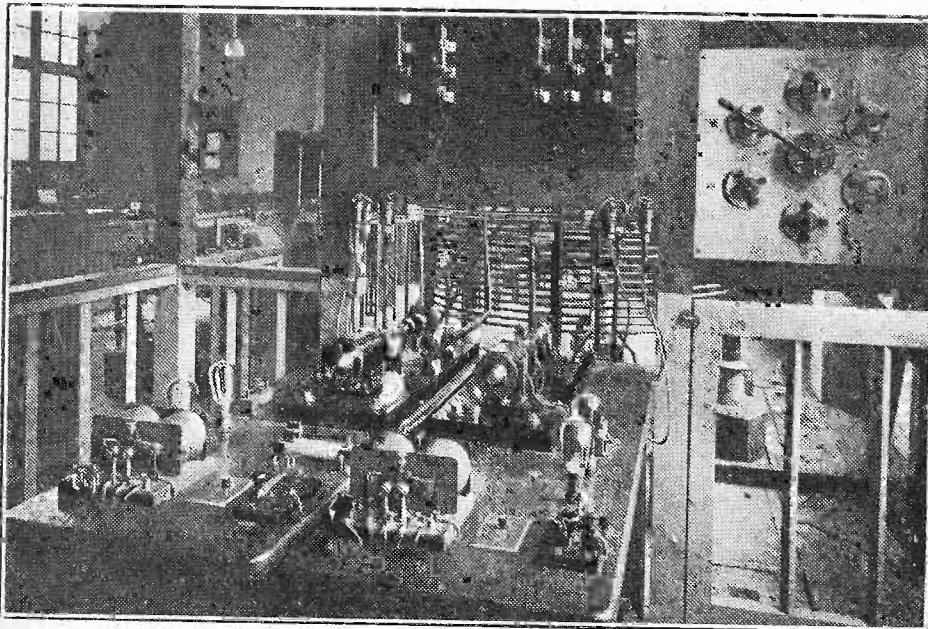
artillery. Here quick and simple means of communication between the machine and the ground are essential. It is necessary for the aeroplane in the air to be able to report the effect of the fire of the artillery, and for the artillery commander on the ground or in the ship to indicate when he is changing target to the aeroplane spotting for him overhead.

### Shelling Invisible Targets.

So great is the range of modern artillery carried on board ship, and so high the perfection of signalling by wireless from the air, that it is possible to direct the fire of a whole fleet at a target invisible beyond the horizon. In long-range firing,



The arc transmitter at Northolt.



The arc keys and wave-changing switches at Northolt.

both from land artillery and from warships, it is of great importance to the observer in the spotting aeroplane if he can know exactly when the shells fired from his own side's artillery are reaching their target.

The projectiles in flight occupy several seconds, and the practice is to signal by means of a prearranged code word the exact instant when the salvo, or group of projectiles, reaches the objective. This enables the spotter to know exactly which of the projectiles, either by the splashes in the sea or the explosions on the ground, the effect of which it is his duty to report to the officer directing the artillery fire, are coming from the guns for which he is observing.

### Telegraphy and Telephony.

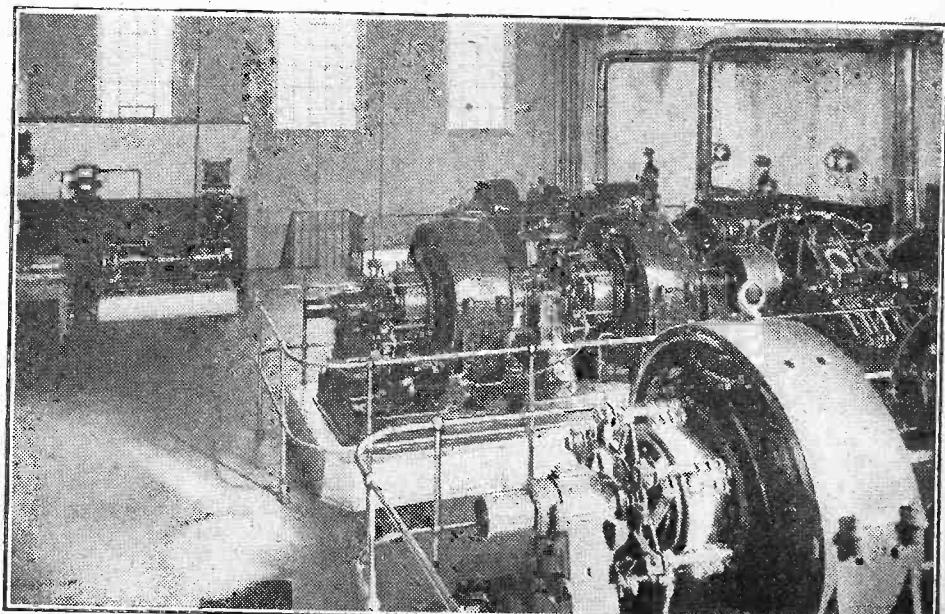
If ever the Navy should be involved in war again, aircraft will be used to a very great extent in convoying merchant ships and protecting them from attack by hostile craft, whether submarines or surface ships. Here wireless is essential.

There has been some controversy as to the respective merits of telegraphy and

telephony. In the largest war machines instruments are carried enabling signalling to be carried out by both methods. The advantage of telephony is that it is more rapid and simple for the transmission of short messages, provided a short, concise, and easily pronounceable code is used. On the other hand, long messages can be passed more correctly by the use of wireless telegraphy and the Morse code, but without such rapidity as by telephone.

Generally speaking, the smaller fighting machines carry instruments adapted for telephonic communication, the larger machines telegraphic instruments, and the long-distance and scouting machines a combination of both methods.

Sometimes the pilot manipulates the instruments and sometimes the observer, but when telephony is employed, arrangements are made for the pilot to listen to what is being received even when he is not actually operating. In the case of artillery observation, the observer invariably handles the wireless transmitter, leaving the pilot free to keep vigilant watch for the approach of enemy aircraft.



The H.T. D.C. turbo generators at Leafield.

# BROADCASTING NOTES.

By O. H. M.

A Radio "Merry Widow"—"Good-night, Everybody!"—Chamber Music Again—"The Rose of Araby"—The B.B.C. and Industrial Disputes.

THE tri-weekly morning broadcasts at Bournemouth, from 11 to 12, are proving so successful that they are likely to become part of a regular programme scheme, at least, so far as holiday resorts are concerned. This raises the point, whether the B.B.C. should not arrange, during the coming winter, to have continuous programmes from 11 a.m. until midnight. Until more alternative services are available, there is no doubt that listeners will demand a longer daily programme period, especially now the licence position is cleared-up and pirates no longer enjoy immunity. But I understand that to give continuous programmes from 11 a.m. until 12 midnight would involve considerable increase in staff and running expenses (expressed in money, something of the order of £50,000 a year). While on this question of programme staff, I might mention that I was talking the other day to a well-known journalist, who was recently called in by B.B.C. in a consultative capacity. What struck him most was the inadequacy of the staff on the programme side.

He says that the B.B.C. carries the idea of economy to the extreme point. There is a real need for twice as many announcers, and for more stage-managers. That the machine keeps moving smoothly at present appears to him to be a remarkable tribute to the zeal and efficiency of the inadequate staff employed.

## A Radio "Merry Widow."

The tremendous success which has attended the various editions of "Radio Radiance," encourages the B.B.C. to explore this line of programme development more fully. The programme experts were not unanimous in their degree of confidence in the success of "Radio Radiance." Many of them maintained that revue depended so much upon colour that it could not be successfully communicated through the ear alone. But Mr. R. E. Jeffrey (the Dramatic Producer), ably assisted by Mr. James Lester, have confounded the doubters. "Radio Radiance" gets across as effectively as any stage revue, and now the idea is to prepare for a much bigger production next summer. The B.B.C. would like to create something as distinct and outstanding in its sphere as was "The Merry Widow" in pre-war musical comedy. Plans for this are under way.

## "Good-night, Everybody!"

At the conclusion of a programme on a recent Sunday, the announcer omitted to say "Good-night, everybody," and following this lapse a large number of letters of protest were received at 2, Savoy Hill.

In an endeavour to please listeners, the announcer later altered his ways and tried to say, "Good-night" to every part of the country and indeed every part of Europe that he imagined might be

within range of his remarks. He had a kind word to say about everyone, and he added a touch of the cosmopolitan by saying good-night to the Continent in various languages. His effort was widely appreciated; there was a perfect deluge of appreciative correspondence. Unfortunately, however, he left out Dundee and one of the smaller islands of the Channel group. He became painfully aware of the former omission at his breakfast table the following morning, when he saw his favourite brand of marmalade. The letters of protest were more sorrowful than

## Next Week's Features.

REDUCING VALVES IN SUPER-HETS.

EXPERIMENTS WITH AN ULTRA-AUDION UNIDYNE.

RADIO IN AMERICA.  
(Part III)

WIRELESS BY LIGHT RAYS.

indignant, and I imagine that he will take an early opportunity of paying his compliments to those who imagine they have been left out of the general scheme of things. Meanwhile, violent controversy still ranges around the subject as to whether it should be "Good-night, everybody," or whether it should be "Good-night, ladies and gentlemen." Opinions among listeners seem to be about equally divided, and now a new school of thought is springing up to support "Good-night, friends," and by no means a still small voice has proclaimed "Good-night, brothers and sisters."

## Chamber Music Again.

Some months ago Chamber Music enthusiasts suffered a reverse, many listeners complained that they were fed-up with chamber music, and they wanted a larger proportion of symphony music. Their wish has been gratified, but now the pendulum is swinging the other way again. Many of the same people who four months ago complained of chamber music are now demanding it. So on Thursday, August 13th, there is to be a special Chamber Music evening at the London station. Miss Beatrice Harrison, the violoncellist, and Miss Irene Scharrer, the pianist, will have the run of the studio. They will collaborate in Brahms Sonata in violoncello and piano in E. Minor, Op. 38. During the evening, Miss Scharrer will play the Funeral March Sonata by Chopin, and in case anybody should get the impression that the programme is too lugubrious, it has been arranged for Mr. Iolo Williams to give readings from 18th Century Poetry, and to make doubly sure, the full fifteen beams of the first edition of the "Radio Radiance" will be revived.

## "The Rose of Araby."

I understand that Bournemouth's recent production of the "Rose of Araby" is so popular, that it is to be done again on August 22nd, when it will be taken also by S. X. The cast includes as its principals, Gertrude Newson, Marjorie Stone and H. M. Corner, George Stone, and the S. B. M. Chorus and Wireless Orchestra, conducted by Captain W. A. Featherstone.

## The B.B.C. and Industrial Disputes.

It has been suggested that the B.B.C. should assume some public responsibility in connection with the solution of such a grave industrial crisis as now confronts the country. It is generally agreed that public opinion determines the issue. The B.B.C. is the best instrument with which to acquaint public opinion of the conflicting points of view. Why not have Mr. Cook for the miners and Mr. Williams for the mine owners each give a broadcast talk either the same evening, or on successive evenings. Surely this would do more to clear the air, and to inform public opinion than anything that has been so far attempted.

## DAVENTRY AS A CLEARING HOUSE.

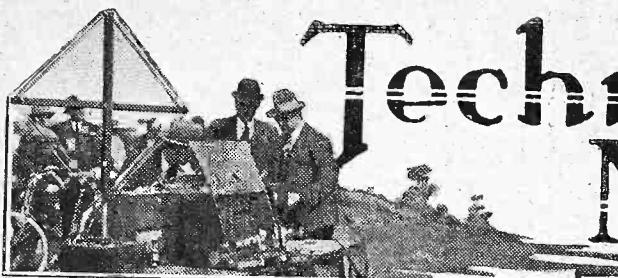
ONE interesting aspect of the Daventry station which appears to have escaped general notice is its projected use as a wireless clearing house. If international broadcasting is to become a regular feature of the ether programmes, it is essential that both America and Europe should be able to rely upon high-power stations to keep in mutual touch.

The Radio Corporation of America is willing to do its part in providing the American link with Europe, and the B.B.C.'s new Daventry station is well equipped to enable Europe to handle the wireless link across the Atlantic.

Lord Gainford, at the annual general meeting of the B.B.C. gave a hint of the coming international era in broadcasting. As a special correspondent of the "Daily Telegraph" points out, by the completion of the new station the first step has been taken to make Great Britain the clearing house of the world for the broadcasting of programmes. The Radio Corporation of America and the B.B.C. have concluded an arrangement for the interchange of programmes, which will come into force in the autumn.

An agreement has also been come to with Germany, while the B.B.C. are projecting schemes for exchanges with France, Italy, Belgium, and other Continental countries. The arrangement is that programmes from the Continent of Europe will not be transmitted direct to America, nor will American programmes be sent direct to Continental countries.

By means of a super-receiving station to be erected at Brondesbury, Kent, international programmes are to be collected and sent to Daventry for distribution. Consequently, Europe will get its American programmes via Daventry, and America its European programmes through the same station. Daventry thus promises to become the world's broadcasting highway.



# Technical Notes

Conducted by our Staff Consultant, Dr. J. H. T. ROBERTS, F.Inst.P.

## Oscillator Valve Without Grid.

THE conventional form of three-electrode valve has now become so common that the fact is apt to be overlooked that it is possible to control the electron stream between the filament and the anode by other than electrostatic means. Electrons may be controlled by means of an electrostatic field, whether they are at rest initially or in motion, but if they are in motion initially they can also be operated upon by a magnetic field. As the electrons in question are in motion, it is possible to do away with the grid, and employ instead a solenoid so placed as to produce, in the region between filament and anode, a magnetic field of the necessary strength and direction, and operated according to the incoming signal currents.

This idea is not, of course, new; it was used by Fleming, and has since been used by many other experimenters. The principal difficulty in using this method of control, however, arises from the fact that the anode is usually constructed in the form of a closed or nearly closed cylinder; owing to the production of eddy-currents in this cylinder, there is an important shielding effect upon the region within the cylinder. According to a new method of construction recently patented, however, the solenoid or winding which produces the control field is placed inside the valve, even inside the anode itself, and the shielding effect, in this way, is largely overcome. Valves constructed on this principle are now made in large sizes to carry considerable power. In fact, according to information which has reached me lately with regard to developments in valve design, it seems not improbable that in the near future important further developments will be brought forward, based on this principle of the electro-magnetic control instead of the electro-static.

## Dull-Emitter Dangers.

A correspondent writes to point out a danger which may not perhaps be at once apparent to many users of the newer types of low voltage dull-emitter valves—such as the 1·1 volt valves, for example. He calls attention to the fact that if these are operated from 2-volt accumulators, using a rheostat, there is a temptation to keep on adjusting the latter so long as the battery will light the valves, which means that eventually the accumulator has been run down to something like 1 volt, or at any rate, considerably below the stipulated safety value of about 1·8 to 1·9 volts.

Owners of battery charging stations state that they frequently receive accumulators which have been run down much too far in this way. The fact is that these low-voltage valves were primarily designed to be operated from dry cells, where the continuous decline in the voltage does not matter. Using the 2·0 volt dull-emitters,

this trouble is not likely to happen, as when the accumulator voltage falls below the safety value, the valve ceases to work.

Experimenters who happen to be using the very low-voltage valves with accumulators should note the foregoing and should be very careful, having adjusted their rheostats, to make only small further adjustments from time to time, and not to go on indefinitely making up for the drop in voltage of the cell by reducing the resistance in series with the filaments by large amounts.

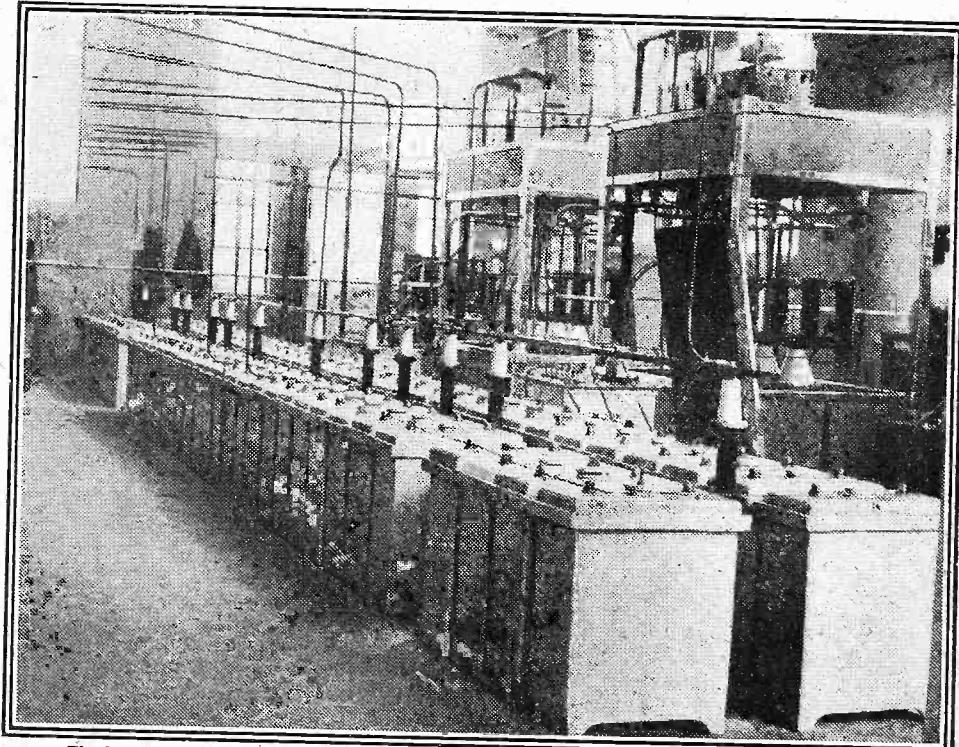
## Vulcanised Fibre.

A good deal of vulcanised fibre is now used in the making of panels for cheaper

perature a few degrees above the boiling-point of water, and the baking continued until simmering has practically ceased, the fibre may be rendered practically moisture-proof. Vulcanised fibre treated in this way has been found to be an excellent substitute for ebonite (particularly for the cheap ebonite, which is always under suspicion) and may very well be used by the experimenter in any except the most exacting conditions. It has the great advantage also that it is much cheaper than ebonite.

## Some Thermopile Points.

A number of points raised by readers with regard to the assembly of the thermopile may be dealt with here. Some readers have asked the reason for using only one layer of elements instead of having the elements in two or three tiers. At first sight it might appear that the latter method was more advantageous, as the hot gasses passing through the lower layer might be used for operating the second, and perhaps the third layers. This method was tried out, but it was found in practice that the second and third layers did not get sufficiently hot, and that the increase in the capital cost and the general additional bulk of the instru-



The huge bank of smoothing condensers in use at the new 5 X X, recently opened at Daventry.

valve sets and/or crystal sets, and as this material has frequently been condemned rather unjustly, it may be well to point out that, with certain reservations, it is quite a valuable substance and, in fact, is often much superior to the cheaper grades of so-called ebonite. Vulcanised fibre is used very extensively for electrical fittings for domestic lighting and such purposes, for which application it is eminently suited. It is very strong mechanically, stronger and tougher than ebonite, and may be readily and cleanly drilled. Its principal drawback for wireless use is that it absorbs a small percentage of moisture from a damp atmosphere.

If, however, the material, after being prepared as a panel, is boiled, or rather baked, in molten paraffin wax at a tem-

ment more than counterbalanced the saving in fuel.

Another practical point in regard to the working of the completed instrument is that when the instrument is first lighted (say, for about the first couple of hours), the mica washers will be found to give off a certain amount of smoke. This is due to the fact that the washers are punched from composite mica material, formed by pressing together layers of mica with shellac. The shellac, however, soon burns out, and after the initial period of working, the smoking will cease.

Only one of the horizontal steel supporting-rods should be tightened at both ends in the end-plates; the other steel rod should be tightened at one end, and should be left

*Continued on page 1024.*

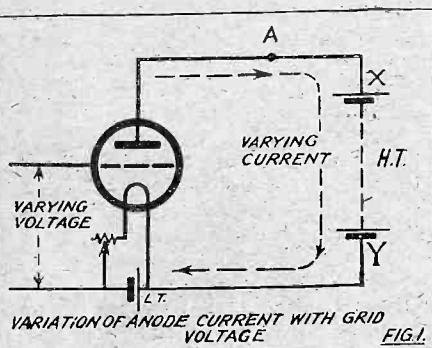
# Methods of H.F. Intervalve Coupling

By Lieutenant-Commander

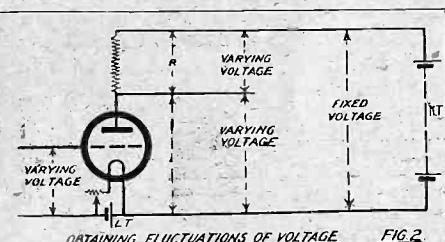
H. W. SHOVE, D.S.O., R.N.

WHENEVER potential variations are applied across the grid and filament of a valve, current fluctuations appear in the anode circuit. In Fig. 1, the voltage between X and Y is fixed, being that

which there is a varying voltage drop. This can be done by the use of a high resistance, R, Fig. 2. This resistance is "aperiodic"—i.e. it opposes all frequencies and direct current equally. As a result of its opposition to D.C. the steady voltage across the valve is reduced in the proportion which I, the valve impedance, bears to the sum of I and R. Extra H.T. will therefore be necessary to maintain the correct anode voltage. Its amount will be equal to the voltage drop across R, when normal steady anode current is flowing. If this current is (say) 1.2 millamps and  $R=50,000$  ohms, the extra voltage required is found by "Ohm's Law": Extra H.T. =  $C(\text{amps}) \times R(\text{ohms}) = 1.2 \times 50,000 = 60$  volts.



of the H.T. battery. If we wish to make use of the current variations, we can connect our apparatus (of comparatively low impedance) directly in the circuit, as at the



point A. This is what we do with a pair of telephones, or the primary of an L.F. transformer.

## Voltage Fluctuations.

But if we require to tap off voltage, as for application to the grid of another valve, we must introduce some impedance across

If grid action now causes the anode current to fall to 2 millamps., the voltage drop across R will fall to 50 volts. But the total H.T. voltage across R and I remains constant. That across I will thus be increased by 10 volts. There are now, therefore, fluctuations of voltage across both R and I, and these can be applied to a subsequent valve (or crystal detector).

The method of doing this is shown in Fig. 3.

The second valve grid must be isolated from the steady H.T. voltage by the blocking condenser "C," whose value, if this valve is another amplifier, is not

critical, provided it is large enough to offer a low impedance to the frequency passing, and is so proportioned to the leak "L" as to avoid unwanted rectification. The purpose of the leak is to maintain the second grid at the correct potential. A bias battery at X may be added if required, or potentiometer control may be used. If this

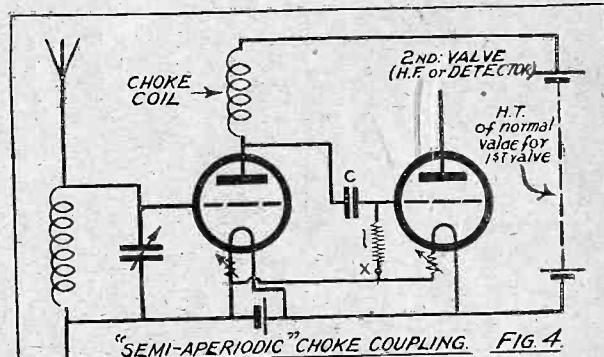
second valve is the detector, the condenser and leak values will, of course, be those necessary for efficient rectification.

The voltage fluctuations will be greater if R is large (and the H.T. increased in proportion). Maximum amplification, equal to the full "amplification factor" of the valve, might be obtained if both R and the H.T. were infinite!

## Loss of Efficiency.

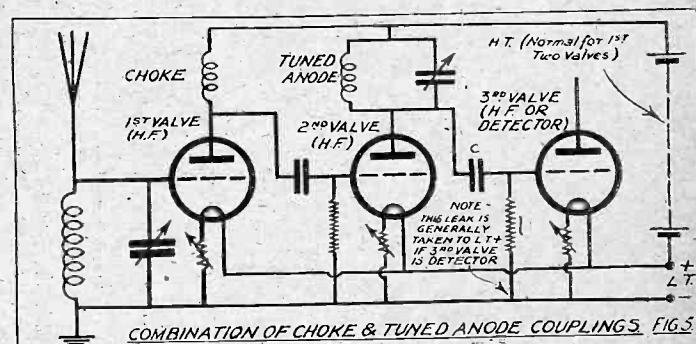
In practice a value of 50,000 to 100,000 ohms gives about 75 to 80 per cent of this, and is all we can use without undue increase of H.T., or introducing noises and losses through heating, caused by the inability of R to handle the required current. The correct value of R for a given H.T., or of H.T. for a given R, can be calculated from the formula above. The steady anode current for the valve can be ascertained from the characteristics now published by many makers.

There is always a leakage of oscillating



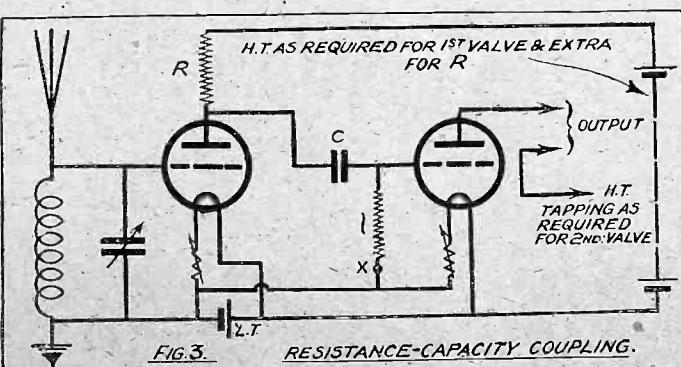
$$1,000 \times 50,000 = 60 \text{ volts.}$$

current due to the capacity between the electrodes of a valve. This leakage increases with the frequency, and when this exceeds about 300,000 cycles per second (equivalent to a 1,000-metre wave) the losses, in ordinary four-pin valves, are sufficient to counterbalance the amplification obtainable with resistance coupling. With special valves, in which inter-electrode



capacity is cut to a minimum, quite useful amplification can be obtained on shorter waves.

In the receiver built by the B.B.C. last year for H.M. the King the method was used on the broadcast band. The B.B.C. engineers sacrificed high efficiency to simplicity and purity of reproduction. Amateurs to whom the expense of extra (special) valves is not a deterrent may follow their example. But great care is necessary in the design, or the H.F. valves may become mere "passengers."

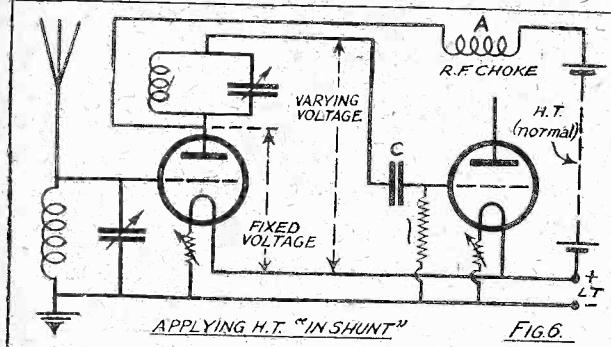


(Continued on page 1016.)

## METHODS OF H.F. INTER-VALVE COUPLING.

(Continued from page 1015.)

A resonant circuit offers a practically infinite impedance to the particular frequency to which it is tuned. But the D.C. resistance of an ordinary tuning coil is



negligible. If, therefore, we substitute a tuned circuit for R, we can get practically the full amplification of the valve, while extra H.T. is not needed. This, the "tuned anode" method, is now almost standard on the broadcast wave band. With 4 pin valves, its high efficiency counterbalances the capacity losses till a wavelength of the order of 200 metres is reached. But the amplification falls off at the higher frequencies, and it is now quite an open question whether it is worth while to use H.F. even on the broadcast band when the detector is a valve. For crystal D X work we must use H.F., if only in order to be able to supply reaction.

The tuned anode is open to two serious objections:

(a) Complication in tuning, which renders

the operation of more than, at most, two stages of H.F. on the principle very difficult;

(b) Uncontrollable reaction through the capacity coupling of the tuned grid and anode circuits in the valve itself.

Double condensers, tuning two circuits at once, have been used to get over (a).

But these require very careful calibration, and seem hardly worth while.

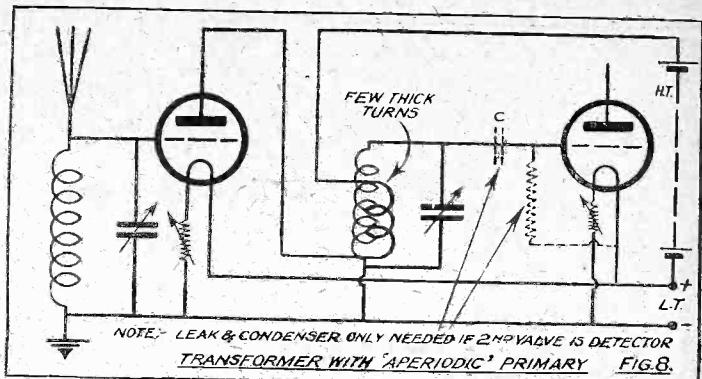
(b) is particularly troublesome on the shorter waves. The "Neutrodyne" and other special counteracting devices have been put forward to overcome it. But they are generally complicated and difficult to work. In the writer's opinion, here as elsewhere, *simplicity* is the keynote of success. A method which obtains stability at the expense of selectivity, and a sacrifice of the highest efficiency, is that shown in Fig. 4. A choke coil of high resistance, and consequent flat tuning, is employed. The "damping" stabilises the circuit, and the flat tuning gives a measure of amplification over a considerable range of wavelengths. This method may be usefully employed in a two-stage amplifier, as shown in Fig. 5. As neither valve has both grid and anode circuit tuned, little reaction is introduced by inter-electrode coupling. If the H.T. is suitably adjusted a resistance can be used instead of the choke.

### Use of "Shunt" H.T.

Fig. 6 shows a circuit in which the H.T. is applied "in shunt." The H.F. impulses are "turned back" from the H.T. battery by the choke coil "A." This may be any ordinary low capacity coil of sufficient inductance

(say about 250 turns). The fluctuations in voltage now take place across the whole of R and I in series, that across I being fixed. We, therefore, connect the second valve as shown. This arrangement tends to neutralise the inter-electrode coupling, and the circuit is very stable, and can be used on waves even below 100 metres.

Finally, we must consider the "transformer" method. In this a coil is inserted in the first anode circuit, and coupled inductively to one in the second grid circuit. The anode (primary) coil may have fewer



turns than the grid (secondary) one. By a well-known rule of alternating-current theory, this should give a voltage "step-up." So the amplification is not limited by the amplification factor of the valve. Actually, if the coils are close together, the capacity between them is considerable, a good deal of energy is transferred in this way, and the "step-up" often becomes illusory. It is, in fact, not generally attempted in close coupled H.F. transformers, the coils being made of practically equal size.

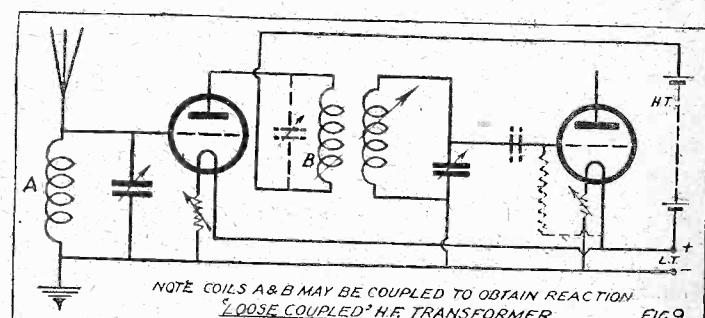
### Transformer Coupling.

There are three types of H.F. transformers (see Fig. 7):

- (a) The close-coupled "aperiodic."
- (b) The close-coupled "tuned."
- (c) The loose-coupled "tuned."

"Aperiodic" transformers have high resistance windings, on the same principle as the "choke" of Fig. 4. It is possible to make the tuning flat enough to cover the whole "broadcast band" of 300-500 metres. But amplification and selectivity both suffer somewhat by the "damping." For multi-stage amplifiers, however, the simplicity of operation recommends the "aperiodic" type.

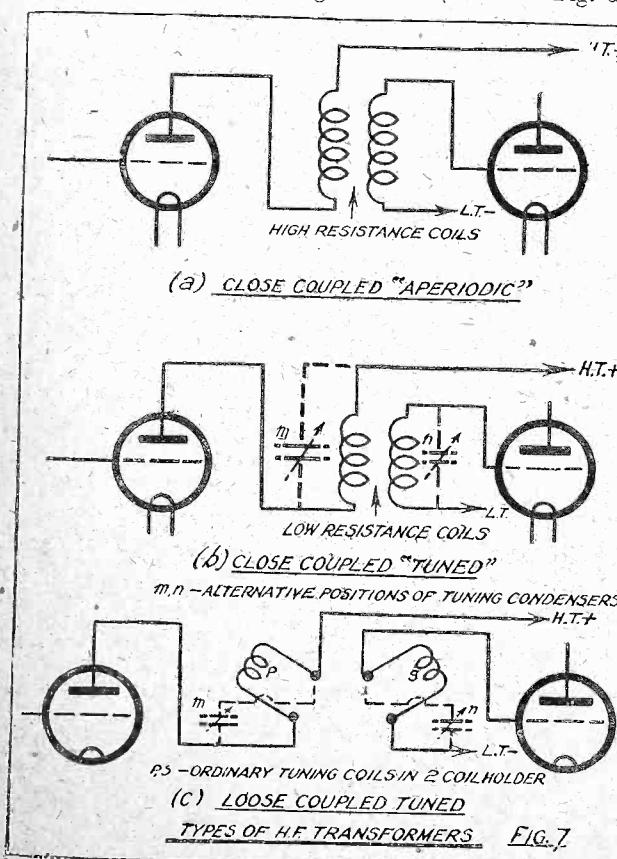
In the close-coupled "tuned" type, the coils interact, so that only one winding need be tuned. There is a slight theoretical advantage in tuning the primary, as this can then be wound with rather fewer turns, so as to give a "step-up." But in practice little difference (if any) is noticeable.



A design not often met with, but having considerable merit, is that of Fig. 8. Here the anode coil consists of a few turns of thick wire closely coupled to a tuned secondary.

This is analogous to the so-called "aperiodic aerial," described in a former article, "Methods of Tuner Coupling," ("P.W." No. 153). The low resistance primary is not really aperiodic, but the secondary only responds to the frequency to which it is tuned. This method is stable and fairly selective.

(Continued on page 1017.)



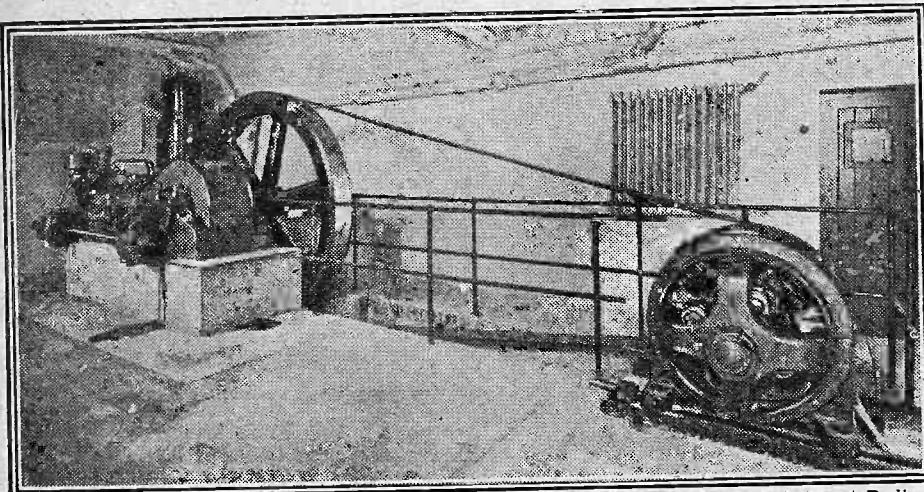
# A CHAT ON ATMOSPHERICS.

"When shall we three meet again, in thunder, lightning, 'X's' and rain?"

(From a revised edition of "Macbeth.")

**W**E are all familiar with "X's," and we are all aware that they are caused by some kind of natural etheric disturbance. But beyond this, knowledge is exceedingly vague, even amongst the most advanced students. The novice, indeed, often has a very definite idea that atmospherics are simply a kind of "wireless thunder" accompanying lightning discharges. But this is only a half-truth. Some atmospherics undoubtedly are of this nature,

One can actually observe the connection of this type of atmospherics with lightning, if one is sufficiently hardy to don the phones during a thunderstorm. The writer has noted a very peculiar effect, due, presumably, to personal idiosyncrasy. He invariably hears the crash before he sees the lightning. Actually, they must be practically simultaneous, the "atmospheric" being really slightly *after* the flash, but only by the infinitesimal interval which the ether wave



The 50 h.p. oil engine and generator installed in the new Telefunken broadcasting station at Berlin.

corresponding more or less to the familiar spark signals. But the explanation does not fully cover the ground, nor does the analogy hold at all rigidly.

#### A Peculiar Phenomenon.

In the first place, thunder is a direct disturbance of the air by the passage of the lightning. It by no means follows that the disturbance of the ether, which is what the wireless receiver translates into sound in the headphones, is at all similar. In the case of an oscillatory discharge, as in the spark transmitter, the note heard when listening to the actual "crackling" of the spark and that produced in the phones of a receiver do correspond. This is because what is heard is the resultant of a rapid series of "clicks," due to successive wave trains, while the disturbance of the air by the groups of sparks causing these trains takes place at the same time interval, so that the musical note is identical. In the case of lightning, however, this is not so, and an unmusical crash is produced.

Thunder has a rolling sound, due to the arrival of the noise from different parts of the discharge path (which may be of great length) at different times, owing to their varying distance from the observer and the fact that the velocity of sound is low compared with that of the flash. This does not apply to the etheric disturbance, which consequently is heard as a single crash for each lightning flash.

takes to travel from flash to receiver. Probably the explanation is that the writer's "ear is quicker than his eye"—i.e., that auditory sensations affect his brain more rapidly than visual. Whether this is commonly the case, or whether any scientific tests have been carried out on the subject, he does not know.

Besides the lightning crashes there are other forms of atmospherics, whose connection with thunderstorms is more doubtful. These take the form of "hissing" or "grinding" noises. The hisses are pretty certainly due to the direct discharge of atmospheric electricity through the aerial system itself, but the "grinders" are much more mysterious.

#### Frame Aerial Tests.

It has been thought that they are due to disturbances in the upper atmosphere, beyond the region of ordinary meteorological phenomena, for they are not necessarily associated with local thunder, nor, indeed, with the prevalence of such weather conditions within a large radius of the receiver. That they come from a distance is proved by the fact that a frame aerial possesses similar direction-finding properties for them as for ordinary signals. In America, where the "static" problem is serious, directional aerial systems have been used with some success to eliminate interference by atmospherics.

Professor Terry, of the University of

Wisconsin, has carried out a large number of experiments to determine the origin of the "grinders." With an elaborate arrangement of direction-finding apparatus, he has accumulated much data and reached some interesting conclusions.

Many observers have noted that the grinders are worse near the tropics than in temperate climates, and on warm than on cool days. Also, that there is a diurnal variation, the interference being least between sunrise and noon and increasing to a maximum just before sunset.

#### No Solution Reached.

During the early part of the night it remains fairly constant, but falls away to a minimum again between midnight and sunrise. The chief value of Dr. Terry's work has been in the determination that grinders seem to originate from certain fairly well-defined areas, and that those areas are the ones wherein the greatest number of thunderstorms are experienced. This seems to indicate that the atmospherics are, at any rate indirectly, connected with such storms. But, at times when thunderstorms are not prevalent, atmospherics may still come in and are then found to coincide in direction with areas of high barometric pressure. So that the connection is not quite clear and we cannot say definitely that we really know what causes this form of atmospherics.

## METHODS OF H.F. INTER- VALVE COUPLING.

(Continued from page 1016.)

Where the transformer coils are loosely and variably coupled, as in Fig. 9, the energy is transferred magnetically. In this case a "step-up" does seem to be obtainable in practice. If it can be done without causing instability both coils may be tuned. If this is done no attempt should be made to obtain reaction by coupling the primary to the grid inductance of its own valve (there is already capacity reaction here).

#### Easy Reaction Control.

The writer has used the loose-coupled transformer extensively, mounting aerial, anode and secondary coils in a three-coil holder in the order named. He prefers to tune the secondary only, and use the coupling of anode coil to aerial for reaction. In the receiver he now has in use, this coupling is reversed, the coils being brought nearer together to suppress self-oscillation.

This is a delightfully easy method of obtaining stability, and can be attained by a careful choice of suitable coils. Actual values cannot be given, as the constants of the receiver will vary with the design of other parts. The variable coupling of the transformer makes for selectivity little inferior to that of a loose-coupled aerial circuit. But it calls for skilled handling to get the best results.

If there is anything in these pages that you do not like, please let us know what it is when writing to us.

# RADIOTORIAL

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REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Little, Ltd., 4, Ludgate Circus, London, E.C.4.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

**TECHNICAL QUERIES.**

Letters should be addressed to :

Technical Query Dept.,

"Popular Wireless,"

The Fleetway House,

Farringdon Street,

London, E.C.4.

They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions : (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the

numbers. (It is not possible to reproduce the question in the answer.)

**IMPORTANT.**—If a wiring diagram, panel lay-out or point-to-point wiring is required an additional fee of 1/- must be enclosed.

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1/- per diagram, and these should be large, and as clear as possible.

No questions can be answered by phone. Remittances should be in the form of Postal Orders.

## Questions and Answers

**REPLIES BY POST.**

J. T. (Balham).—As your queries sent in on July 9th are of insufficient interest to the general reader, will you kindly forward us your address, so that your query can be dealt with through the post in the usual way?

**ACCUMULATOR RECHARGING.**

H. W. S. (Brighton).—What factors must be known in order to tell how long an accumulator should last before it requires recharging?

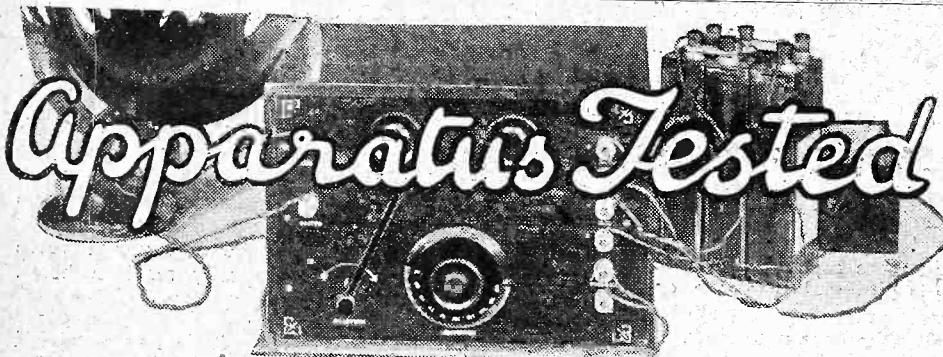
Two factors are necessary, and when these are known it is very easy to calculate the time that the accumulator should last.

First, it is necessary to know the actual capacity of the accumulator (which is generally marked upon it). Secondly, the total current consumption of the valves in use.

Suppose the accumulator is marked

"Capacity Ignition, 40 ampere hours, Actual, 20 ampere hours." and that two valves are used each taking 2.5 amps.

(Continued on page 1022)



Traders and manufacturers are invited to submit wireless sets and component parts to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test Room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—THE EDITOR.

"RADIO CONDIT" is the name of a new form of conductor due to Messrs. Autovoyors, Ltd., 82-84, Victoria Street, Westminster, London, S.W.1. In effect it is thin copper tubing with polished interior and exterior surfaces, added to which it is tinned on the latter. That "Radio Condit" is efficient, particularly for wiring up H.F. circuits, is immediately obvious, for it has good surface area without introducing metallic "bulk." It can be bent to required shapes quite easily, although the position of the seam must be arranged so that unsightly "spreading" does not occur. "Radio Condit" is made in 24-inch lengths, and sold at 2s. per packet of 6 to 12 feet in all. The "low-loss law," which appears on the leaflet describing this conductor, is well worth repeating. "Avoid all insulation, other than air wherever

possible, and employ the minimum of metal adequate to current capacity required." We do not, however, like to regard the circuit of a "super het." shown as anything but a decoration, for we are sure that even connected up with "Radio Condit" it would not work. For one thing, three of the intermediate grid circuits are most incomplete, while the L.F. stage has a capacitively "floating" grid.

\* \* \*

A new anti-microphonic capacity valve-holder has been placed on the market by the Enterprise Manufacturing Co., Ltd., Electric House, Grange

Street, W.C.2. It is known as Barrie's Anti-phonic, and sells at 1/9 retail. It is quite suitable for baseboard mounting, one centrally placed holding screw being all that is necessary for the purpose. Insulation from vibration is achieved by means of a circular pad of spongy rubber which fits neatly underneath. Well sunken sockets prevent possibilities of burn outs, and soldering tags are provided for connecting purposes.

The device, as well as being "anti-phonic" is of low-capacity, too, as the metal parts of the sockets are something less than  $\frac{1}{4}$  in. long. Very good contacts are made with the legs of valves, however, better, if

(Continued on page 1020.)



A B.T.H. portable receiver provides entertainment during a long motor-car run.



WESTERN ELECTRIC Head Receivers are recommended by all discerning wireless enthusiasts as the finest instruments for all round reception of English and Foreign programmes.

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# Western Electric

HEAD RECEIVERS.



said the coil, "couldn't get good results with the other condenser that used to be here. I can see you're different." "Yes," murmured the Watmel, "I've been built to give a more efficient condenser service. They've made me round to eliminate edge losses and you should see the way my mica sheets are clamped and riveted between the plates. You can't make MY capacity vary."

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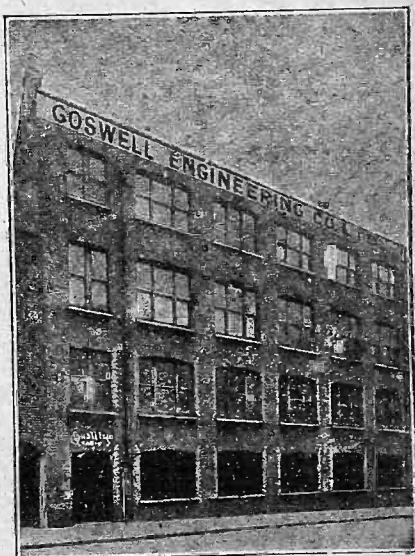
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## APPARATUS TESTED

(Continued from page 1018.)

anything, than those which obtain with standard valve sockets of conventional lengths.

A sample of the solid fuel "Meta" was tested by us recently. It is a white substance sold in small blocks. It burns with a hot, clean flame, and leaves no residue whatever. One small block lasts 15 minutes, but it can be extinguished and relit when required. It will heat a small soldering iron in four minutes. Neat burners are supplied at 9d. "Meta" is perfectly safe, and can even be carried in the pocket without danger. It is sold in packets of 20 bars for 1/-, or 100 for 3/6.

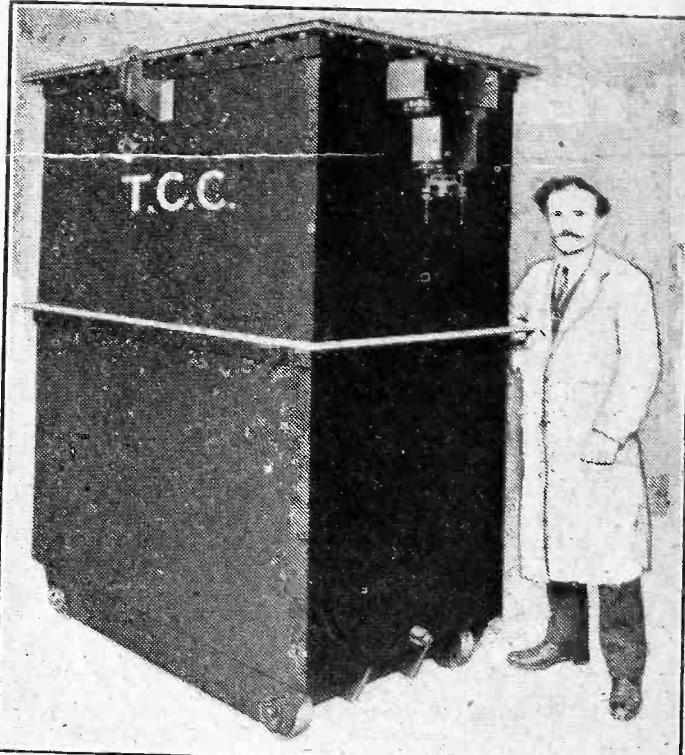
From Messrs. Oldham & Son, Ltd., we recently received a 120-volt accumulator high-tension battery for test. It consists of 10 blocks of six cells. Each of these blocks is contained in a separate wooden case, and is removable and the whole is enclosed in a larger handsome wooden holder fitted with carrying handles. Every cell of the total 60 is provided with a socket, and by means of a number of leads fitted with plugs, almost every conceivable arrangement and number of cells is obtainable. The individual cells are made up with two stout plates, each enclosed in glass containers and provide capacities of 1·4-ampere hours, which are, of course, more than ample for the purpose.

The battery, while admittedly large in dimensions, is of good appearance and designed in a most commendable manner. It could hardly be equalled in this respect. Evidently Messrs. Oldhams determined to force their product to the forefront by paying, firstly, attention to quality and then to originality of design. In operation the battery functioned more silently and generally more efficiently than any other we have tested. To those who have not employed H.T. accumulator batteries it would be a revelation. The elimination of internal battery resistance appears to make considerable differences, quite apart from those that are normally to be expected, and reception all round appears to benefit by the use of secondary instead of primary cells.

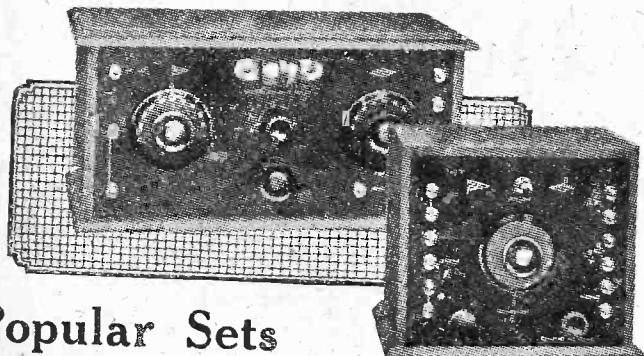


We charged the battery up—quite a short process, of course, and discharged it several times, sometimes rapidly, sometimes slowly, and throughout results given remained con-

sistently good. Messrs. Oldham & Son, Ltd., may be comparatively newcomers in the battery world, but they have started off at a point where but few have reached



This large T.C.C. product is an illustration of the versatility of the ubiquitous fixed condenser which, on the other end of the scale, can, as in an amateur's receiver, be much smaller than a matchbox.



**Popular Sets**  
designed by "Popular Wireless."

Whichever Set you decide to build you cannot go far wrong if you select one of the Pilot Sets designed by the Editorial Staff of "Popular Wireless." The large single-valve Reflex Set illustrated above will cover most British Broadcasting Stations with ease on the headphones, and work a Loud Speaker within 20 miles or so from the nearest one. Cheap to buy—simple to manipulate—and economical to run—that is what you may expect from Pilot Receiving Sets. If you want something more ambitious, send 3d. for a copy of our Pilot Chart, showing illustrations of more than 30 easy-to-build Receivers. Should you be interested in Super Heterodynes, send 2d. for an instructive folder on the Keystone equipment. All amateurs need our 48-page Catalogue of Components (post free 3d.) and Petoscott's Wireless Book (post free 1/5).

**PETO-SCOTT CO., Ltd.**  
Registered Offices, Mail Order, and Showroom:  
**77, CITY ROAD, LONDON, E.C.I.**  
Branches: LONDON—62, High Holborn,  
W.C.1. WALTHAMSTOW—230, Wood St.  
PLYMOUTH—4, Bank of England Pier  
LIVERPOOL—4, Manchester St.

'BEST WAY' 1-VALVE REFLEX.		£ c. d.
2	Peto-Scott square law Condensers . .	16 3
1	" Gravity " Detector	6 6
1	Microstat Filament resistance . . . .	2 9
1	2-coil Holder . . .	5 6
10	terminals, Mark III .	
1	Valve Holder . . . .	1 3
1	Max-Amp. Shrouded Transformer . . . .	19 6
2	Peto - Scott fixed Condensers . . . .	2 9
	Wire, screws, etc. . .	9
1	" Red Triangle " Ebonite Panel, drilled and engraved .	9 0
	Polished Mahogany Cabinet with base- board . . . .	1 1 0
		£4 7 0

**87/- buys all  
the parts**

P.S. 3279

The advertisement is set against a dark background with a grid pattern. At the top, the word "TUNGSTALITE" is written in large, bold, white letters. Below it, "THE SUPER CRYSTAL" is written in a slightly smaller, bold, white font. In the center, there is a large, flowing, cursive-style text that reads "Proved 99.5% efficient in recent tests." To the right of this text is a circular graphic. Inside the circle is a tube of crystal with the words "TUNGSTALITE" and "SUPER CRYSTAL" printed on it. A curved banner or ribbon surrounds the tube, with the words "STALI / SUPER / STA / RAY" written on it. On the far left, there is a white-bordered box containing text. This text discusses reports from around the world about the success of Tungstalite. It also mentions that it is obtainable from dealers or directly from Tungstalite Ltd. at their address in London. There are two circular labels at the bottom left and bottom right. The left label is for "BLUE 1/6 LABEL" and the right label is for "GOLD 2/- LABEL". At the very bottom center, the text "BUY YOUR SPECIMEN TO-DAY." is printed.



**G**OOD news travels apace—and it is not surprising, therefore, to find that wireless enthusiasts are gladly paying the few shillings extra for Radion Panels. Already they have realised that at a very small extra cost they can insure against surface leakage and all the deadly ills to which cheap ebonite is prone.

**R**adion is available in 21 different sizes in black and mahogany. Radion can also be supplied in any special size. Black 1d. per square inch, mahogany 1½d. per square inch.

## RADION Trade Mark

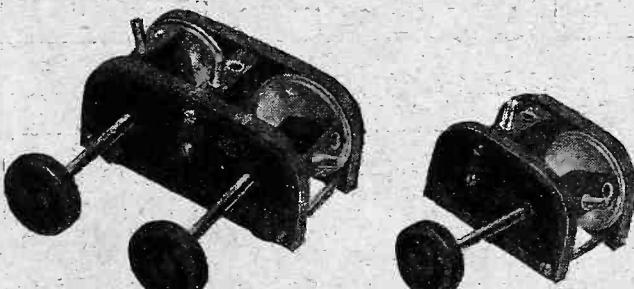
American Hard Rubber Company (Britain) Ltd.  
Head Office: 13a Fore Street, London, E.C. 2  
Depots: 120 Wellington Street, Glasgow.  
116 Snow Hill, Birmingham.  
Irish Agents: 8 Corporation Street, Belfast

Gilbert Ad. 3282.

**A GOOD RECEIVING SET  
IS WORTH THE BEST.**

**The "LOTUS," Cut-Geared  
Vernier COIL HOLDERS  
ARE THE BEST! (Prov. Pat. 23897.)**

Perfect reception at last. Made from Bakelite Mouldings with nickel-plated parts.



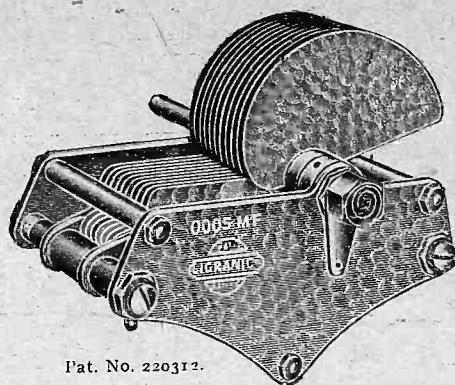
**RETAIL SELLING PRICES.**

Two-way, 7/-. Three-way, 10/6

Vernier movement actuated by three sets of encased precision cut gears. Representing a reduction of 8 to 1.

*Moving Block Cannot Fall.*

**GARNETT, WHITELEY & Co., Ltd.,  
Lotus Works, Broadgreen Road, LIVERPOOL.**



Pat. No. 220312.

## IGRANIC

**Low-Loss Square-Law  
Variable Condenser**

Prices:

0003 mfd.	21/-
0005 ..	24/-
001 ..	27/6

Write for List Z 655 which illustrates and describes the complete range of Igranic Radio Devices.

All reputable dealers stock.

Its technical features include:

- (a) Extremely low electrical losses, its high-frequency resistance being only .5 ohm 3,000 kilo-cycles.
- (b) Accurate square-law characteristic.
- (c) Adequate screening, eliminating hand capacity effects.
- (d) Positive electrical connection to moving plates, ensuring high efficiency and preventing objectionable noises when tuning.

Outstanding mechanical features are:

- (a) Extreme rigidity and strength.
- (b) Combined ball and friction thrust bearings, providing for exceptional smoothness in operation.
- (c) Provision of positive travel stops.
- (d) Fixed and moving plates are of stout sheet brass.

The Igranic Low-Loss Variable Condenser may be described as a laboratory instrument at a commercial price.

BIRMINGHAM.  
CARDIFF.  
GLASGOW.

149, Queen Victoria St.,



LEEDS.  
MANCHESTER.  
NEWCASTLE.

London. Works: Bedford.

**The Crystal for the  
Connoisseur**

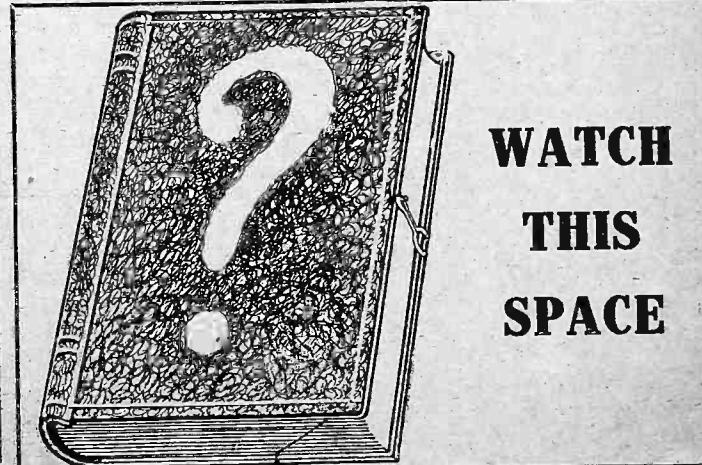


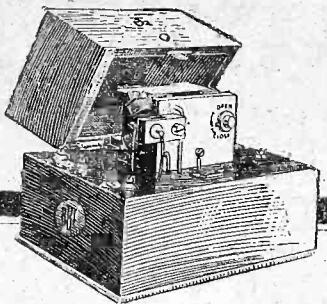
**RUSSELL'S Crystals**

Greater volume and longer range for your set if you fit the 100% pure crystal manufactured by

Two Grades in Sealed Boxes  
Retail Price 1/- & 1/6

The L. G. RUSSELL  
Laboratories, 1-7, Hill  
Street, Birmingham.  
(Opposite Empire Theatre.)





## Volume without Valves

**WHEN purity of tone is the goal at which you are aiming use a Brown Microphone Amplifier instead of two stages of low frequency amplification. And besides getting infinitely more life-like reproduction you'll save money. There are no Valves to buy—no accumulators to be recharged—no expensive L.F. Transformers to purchase—yet you'll get the volume just the same.**

### TWO TYPES AVAILABLE:

Type C. for use with any Crystal Set to operate a large number of pairs of Headphones. Ideal for Hospitals, etc.; will also operate a Loud Speaker if signals are fairly strong in the first place. Type V. for use with a 1-valve Set to operate a Loud Speaker.

Type C.  
4000 ohms input £6:0:0  
2000 ohms output

Type V.  
120 ohms input £5:5:0  
120 ohms output  
2000 ohms input £5:8:6  
120 ohms output  
2000 ohms input £5:13:6  
2000 ohms output

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57 HIGH ST., SOUTHAMPTON

**Brown**  
Wireless Apparatus

Gilbert Ad. 3274.

## RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 1018.)

The number of hours which the accumulator should last will be found by dividing the total current consumption into the *actual capacity*.

In this case, where two valves each taking a quarter of an amp. are in use, the total current consumption will be .5 amp. When this is divided into 20 ampere hours the answer is 40, which is the maximum number of hours that the accumulator can supply current for the set.

### POTENTIOMETER CONSTRUCTION.

G. B. (Sheffield).—What is the simplest method of constructing a reliable potentiometer, using 36 "Eureka" S.S.C. wire, and how do I connect it to my H.F. and Det. set?

Wind a former 4 in. by  $\frac{1}{4}$  in. with the 36 "Eureka" wire. This will take about 20 yards. A slide should be fixed on the same principle as that of a single-slide inductance coil. Both ends of the winding should be connected to terminals. The potentiometer should be joined across the L.T. battery, and the slider of the potentiometer connected to the earth end of the A.T.L. after the side of L.T. previously connected to this point has been disconnected.

### HOME-MADE COILS.

J. H. Y. (Lechlade).—I am constructing a two-valve set (H.F. and Det.) with which I am going to try DX (long-distance) reception. I wish to use basket coils, or the multi-layer honeycomb type, as I have some of both on hand. I am uncertain of the wave-lengths covered by the different coils, and presume that they are about equal for both types.

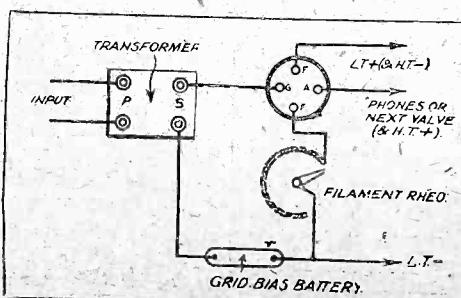
As I shall make my own basket coils, what is a good size for the centre diameter of the former, and how many slots should be used?

The accompanying table shows the approximate wave-length range of the various numbers of turns of the multi-layer coils. Basket coils do not cover such high wave-lengths as the other types, so a correction factor is given from which the range covered by the basket type can be estimated.

### GRID BIAS.

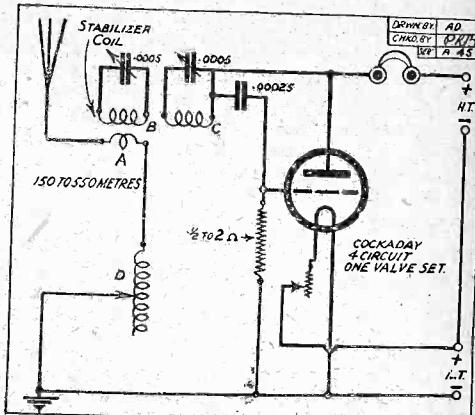
"CONSTRUCTOR" (Lowest of 6 ft).—I am making a four-valve set (H.F., Det., and 2 L.F.). In the last stage of L.F. I am going to use a power valve, but I have been told that to get maximum results from this valve I should employ grid bias. Can you give a simple diagram, giving the connections to a grid bias battery? (Note H.T. — is connected to L.T. +.)

The diagram is given herewith. The grid bias battery should consist of a tapped battery of 9 volts tapped every 1.5 volts. This battery should be adjusted until maximum volume and clarity are obtained. It will be found that by carefully adjusting the grid bias battery that an increase in volume is obtainable without the excessive use of H.T. When using a power valve it is also advisable to employ a separate H.T. + tapping for each amplifying valve.



### COCKADAY CIRCUIT.

"COCKADAY" (Birmingham).—Having graduated by building a great many one-valve sets, I am now anxious to try the Cockaday Four Circuit set, which is so popular in the U.S.A. I think I could manage to do this from the theoretical connections if you can give me a diagram together with the component values. Is the set likely to be as successful in this city as in America, or must special apparatus be employed to get the best results?



A theoretical diagram of the Cockaday "Four Circuit" tuner is reproduced herewith. The set is quite easy to operate, but may be found very difficult to tune from brief directions, as the inventor laid great stress upon exact spacing, etc.

The special feature of the circuit is the single-turn inductance, A, connected in series with the aerial. This is coupled to a stabiliser circuit, B, which, in turn, affects the tuned secondary circuit, C. The tuning of the aerial circuit is carried out by a separate coil, D, which is varied by tappings.

The coils A, B, and C are wound on a  $3\frac{1}{2}$  in. diameter tube. A consists of 1 turn of 14 bare wire; B,

### PLUG-IN COILS.

Wire for Primary.	Wave-length with Average Aerial.	Primary Turns.	Secondary Turns.	Anode Turns.	Reaction Turns. (approx.)
24	260-375	25	35	35-50	35-50
24	310-515	35	50	50-75	50-75
26	370-730	50	75	75-100	50-75
26	460-1030	75	100	100-120	75
26	580-1460	100	150	150-200	75
26	790-2200	150	200	200-250	75
26	1060-2850	200	250	250-300	75
26	1430-4000	250	300	300-400	75-100
28	1680-4800	300	400	400-500	75-100
28	2180-6300	400	500	500-600	100
30	3130-8500	500	600	600-700	100
30	4100-12000	600	700	700-800	100
32	5100-15000	750	850	800-900	100
32	6300-19000	1000	1100	1100-1200	100-150
34	7100-21000	1250	1350	1350-1450	100-150
36	8300-25000	1500	1600	1600-1700	100-150
.001 mfd. in parallel		.0005 mfd. in parallel	.0002-.0003 mfd. in parallel		

For basket coils allow about 20 per cent. off the maximum wave-length. Wind on a former of 11 slots, with centre diameter of  $1\frac{1}{2}$  inches. For a .0005 mfd. condenser instead of .001 mfd. allow 35 per cent. off. Many well-known coils are subject to letters patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

34 turns of 18 S.C.C.; and C, 65 turns of 18 S.C.C. B and C are first wound on the same tube, spaced in, apart, and then A is wound directly over the stabiliser coil B at about  $\frac{1}{4}$  in. from the beginning of it.

The inductance D consists of 43 turns of 18 S.C.C. wound on a separate tube  $3\frac{1}{2}$  in. in diameter, tapped at 1st, 3rd, 7th, 13th, 21st, 31st, and last turns.

The wave-lengths covered range from approximately 150 to 550 metres, when condensers of the values shown are employed.

The receiver gives excellent results in skilled hands, and was designed for operation in areas with very bad jamming. In the absence of the exact specification of the inventor as regards lay-out, etc., it will probably be necessary for you to experiment with lay-out, but as you have considerable experience, you should be able to get the circuit going successfully.

**IMPORTANT NOTE.**—Owing to a draughtsman's error, the lead joining the plate of the valve to the phones has been shown connected to the wrong side of the variable .0005 condenser across the coil C. This lead should be joined to the other side of the coil C instead—i.e. the side nearest to the stabiliser coil.

## CONTINENTAL NEWS

(Continued from page 1002.)

## K. RAYMOND

## Radio Invades Paris Exchange.

The Paris Bourse de Commerce (Produce Exchange) is being fitted with radio loud speakers with the object of facilitating telephonic communications during the business rush hours.

It frequently happens that there is great delay in getting a member of the Exchange to attend to an urgent call put through to him by one of his foreign correspondents. With the aid of the loud speaker, the man's name will be broadcast throughout the building, together with an indication of the sending city.

This will, it is reckoned, appreciably shorten the average duration of calls and relieve the wires.

\* \* \*

## Reorganising Wave-lengths Meets Difficulties.

The international conference which met here last week to endeavour to arrive at a better organisation of European wave-lengths so as to avoid mutual interference, has met with considerable difficulties in drafting a satisfactory scheme, and it has been decided to hold a series of extensive experiments in September to test the practicability of various suggestions made at the conference.

It is unlikely that, as a result, there will be any extensive changes in wave-lengths, though there will be a certain amount of reshuffling of existing arrangements.

One of the difficulties which affects all countries with a seaboard is interference by ship-radio messages, the normal wave-length of which is 600 metres.

The British representatives pressed for a solution which would allow the oldest stations to retain their present wave-lengths, but the conference amended this by a proviso that each country should be allowed at least one wave-length of between 300 and 500 metres.

Altogether the problem has proved on examination to be much more difficult than had been thought, and no final arrangement can be expected till several months have elapsed.

\* \* \*

## Portugal Begins to Think About Radio.

So far, there is no radio station in Portugal. There are, however, several thousands of amateur receiving sets in operation who depend on foreign broadcasting stations, notably on the Spanish ones.

An agitation is being started in the Press for the erection of a Portuguese station, and it is probable that one will be put up in the autumn in the vicinity of Lisbon.

\* \* \*

## New German Amateur Station.

It is announced from Magdeburg that the local Radio Users Amateur Association will next week open an amateur sending station. The times of transmission will be Wednesdays from 3 to 4 p.m., and Sundays from 11 to 12 a.m.

Any listeners picking up these messages are requested to send particulars to Mr. Leonhardt, Fuerstenauer 16, Magdeburg, Germany.

**HULLO EVERYBODY!**  
ALL GOODS POST FREE U.K. except where stated. Foreign orders over £10 post free otherwise please send ample for post, etc. Trade orders U.K. less 20%. Post extra. Open all day Saturday.

## SUNDRIES

REFLEX COILS	
Made under licence	
Burndepat. Patent No.	
168249	
No. 35	150/200 8d.
No. 50	200/500 9d.
No. 75	300/750 1/-
No. 100	400/1,000 1/2
No. 150	600/1,500 1/8
No. 200	800/2,000 2/9
vernier	9/-
No. 250	900/2,500 3/3
Post 2d. each.	

Coil plugs, plain.

2 for 1/3

Shaped wedge 2 for 1/6

Do. Edison Bell 2 for 2/-

Do. Nickel sides 2 for 1/6

Do. fitile fibre 2 for 1/6

Ebonite do. 4/11

Edison Bell 10 do. 27/6

Fixed Condensers

Edison Bell 100 1/3

Amplion Do. 100 1/3

Amplion AR19...105/-

0.022 up to 0.005 1/3

0.022 up to 0.06..2/9

Grid leak &amp; clips 1/3

True Music Minor 21/-

Ultra...27/6

0.003 &amp; grid leak 2/6

Dublin

0.001 to 0.005 each 2/6

0.001 to .006 each 3/-

2 or 3 meg Grid

Leak

Anode res. on stand 5/6

(50, 70, 80, 100, 200 ohms)

2 midf. T.C.C. 4/8

1 midf. T.C.C. 3/10

2.5 midf. T.C.C. 3/8

Spade tags, doz. ..6d.

Bus Bar, 1/16th sq. ...12/-

Solid Rod Valve Holders

1/3

Bretwood do. ....1/9

H.T.C. under panel 1/6

H.T.C. over panel 1/9

Raymond Rheostat 1/6

R.I. Detector 6/-

Voltmeter, each 5/6

Twin Flex, 12 yds. 1/9

Red &amp; Black, 12 yds.

Holders 1/3

Terminals complete

Pillar, doz. 1/-, 1/3

W.O. ....1/3

Super Success

(black)...21/-

Brunet shrouded

3-1 or 5-1...13/6

Croix...9/6

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Solid Rod Valve

Terminals complete

Pillar, doz. 1/-, 1/3

W.O. ....1/3

Telephone, Success

Both genuine...1/3

VALVES

B.T.H. Ediswan, Marconi

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Power valves all stocked

Anode Res.

Var. Grid Leak...2/6

Choke...10/6

Lissen L.F. T.1 30/-

Lissen L.F. T.2 25/-

Lissen L.F. T.3 16/6

Lissen Coils

25, 4/10 35, 40 4/10

50...5/6 60...5/4

75...5/4 100...6/5

150...7/10...200

8/8, 250 9/6, 100

9/8, 400 10/3. Rheostat 4/G 30 ohms 7/1

Lissen X Coils

50 x 6/7...60 x 6/4

75 x 6/5...250 x 9/9

Colver Vernier...2/6

Ditto, Neutrodyne 3/6

Ormond ditto...2/6

Non-Pong V.H. 4/3

Phones 20/- &amp; 22/6

PrimaX Loud Speaker

R.T. Choke...10/6

Peter KR...2/6

4 and 6 BA Nuts and Screws, six dozen for 3/-

VERY IMPORTANT

If you buy 20/- goods

at full list prices you

can have one pair of

high class 'phones

value 12/6. 4,000 ohms

for 5/- extra.

N. &amp; K. guaranteed

genuine (4,000 ohms),

stamped N. &amp; K. 1 pair

given free to each

retail customer pur-

chasing £5 worth goods

at full list prices.

YOURS PANEL DRILLED

FREE WITH 25/- order

(Detail)

COVERS PRECISION

Variable.

I WILL QUOTE YOU LOWEST PRICES. MANY GOODS PRACTICALLY

UNOBTAINABLE ELSEWHERE CAN BE SUPPLIED AT SHORT NOTICE

TO RETAIL CUSTOMERS.

7 WEST-END LEADING STOCKIST FOR Edison Bell, Jackson's (J.B.), Polar, Igranic, Elwell, Peerless, Eureka, Magnum, Burndepot, Lotus, Dubilier, Marconi, Dorwood, Sterling, Success, B.T.H., McMichael, Lissen, Woodhall, Utility, R.I., Bowyer-Lowe, Amplion, Formo, Brunet, Ormond, Peter Curtis parts, etc. SEND YOUR LISTS AND

I WILL QUOTE YOU LOWEST PRICES. MANY GOODS PRACTICALLY

UNOBTAINABLE ELSEWHERE CAN BE SUPPLIED AT SHORT NOTICE

TO RETAIL CUSTOMERS.

7 GRAPE STREET

SHAFTESBURY AVENUE, W.C.2

New Oxford Street end.

NOTE! Grape Street is between Prince's

Theatre and Mudie's Library.

DAILY 9 a.m. to 8 p.m.

SUNDAYS 11 to 1 p.m.

All day Saturday.

1 minute Tottenham

Court Road Tube.

3 minutes Holborn

Tube.

2 minutes Palace

Theatre.

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## SUNDRIES

REFLEX COILS	
Made under licence	
Burndepot Patent No.	
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No. 35	150/200 8d.
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No. 100	400/1,000 1/2
No. 150	600/1,500 1/8
No. 200	800/2,000 2/9
vernier	9/-
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2 for 1/3

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Do. Edison Bell 2 for 2/-

Do. Nickel sides 2 for 1/6

Do. fitile fibre 2 for 1/6

Ebonite do. 4/11

Edison Bell 10 do. 27/6

Fixed Condensers

Edison Bell 100 1/3

Amplion Dragon 1/2

Amplion Do. III 5/6

Amplion Do. Luxe 65/-

Amplion AR19...105/-

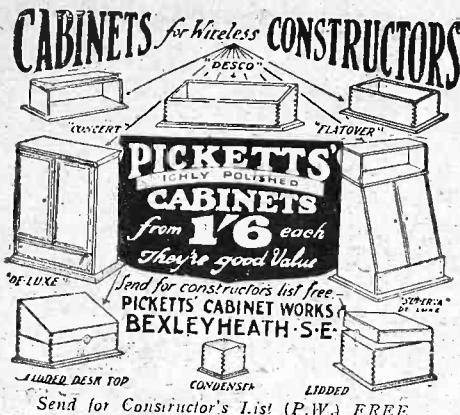
Dubrovox 42/-

True Music Minor 21/-

Ultra...27/6

0.0025, 6/6 (with vernier 1/6 each ex.)

0.0025, 6/6 (with vernier 1/6 each ex.)&lt;/



Send for Constructor's List (P.W.) FREE.

### HEADPHONE REPAIRS

Rewound, re-magnetised and readjusted. Lowest prices quoted on receipt of telephones. Delivery three days.—THE VARLEY MAGNET CO., London, S.E.18. Phone 888-9 Woolwich. Est. 26 years.

**PATENTS, TRADE MARKS, INVENTIONS**  
ADVICE, HANDBOOK & CONSULTATIONS FREE  
B.T. KING, C.I.M.E., Regd. Patent Agent (G.B., U.S. & Canada), 146a, Queen Victoria Street, London, E.C.4. 39 years' references.

**ACCUMULATOR BARGAINS.**  
C.A.V. & Fullers, soiled, but guaranteed 12 months.  
Sent on approval against cash:  
2v.-40a ... 9/6 4V.-80a ... 27/6 6V.-60a ... 32/6  
4V.-40a ... 17/6 4V.-100a ... 32/6 6V.-80a ... 40/-  
4V.-60a ... 21/6 6V.-40a ... 25/- 6V.-100a ... 46/-  
MAUDE RUBBER CO., 58, PRAE ST., W.

**CABINETS—CABINETS**  
**SOLID 1"** OAK OR MAHOGANY.  
Sloping type with removable back.  
Panel Size 9x6 7/6 9x9 8/6  
9x12 10/6 9x15 14/6  
American Concert Style with hinged lid.  
Panel Size 9x12 14/6 9x15 17/6  
8x16 17/6 8x20 23/6  
Enclosed Cabinet with double doors and cupboard under.  
Panel Size 12x9 27/- 12x12 32/-  
12x15 42/- 12x18 54/-  
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**2-VALVE AMPLIFIER, 35/-**  
1-Valve Amplifier, 20/-, both perfect as new;  
Valves, 4/6 each; Smart Headphones, 7/6 pair;  
new 4-Volt Accumulator, celluloid case, 13/-; new  
60-Volt H.T. Battery guaranteed, 6/-; 2-Valve  
All-Station Set, £4. Approval willingly given.  
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**DON'T BUY NEW 'PHONES!**  
Every class of repair to 'phones and transformers. Rewinding 4,000 ohms, 5/- pair. All work guaranteed. Prospectus P gratis. Over 8,000 satisfied customers. Ready same day. hone: Central 1950.  
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FIT ONE TO YOUR SET  
Self-Cleaning Contact, Nickel Plated. PRICE 1/-  
From Your Dealer or Post Free from  
**REDGATE MFG. CO., 32a, Wheeler Gate, NOTTINGHAM**

**RADIO "CROXSONIA" PANELS**  
See Croxsonia seals on all panels  
Black matt finish, insulation perfect, rigid without being brittle, drills, cuts and taps perfect:—7" x 5" 1/2; 8" x 5" 1/2; 7" x 6" 1/3; 9" x 6" 1/7; 10" x 8" 2/1; 11" x 8" 2/3; 10" x 9" 2/4; 12" x 8" 2/6; 11" x 9" 2/7; 12" x 9" 2/10; 12" x 10" 3/-; 14" x 10" 3/5; 14" x 12" 4/-, 1/8" thick. Post free. Callers, cut any size, and quote by Post. Exceptional Terms, sample and prices post free to the Trade. To Sole Manufacturers: **CROXSONIA CO., 10, South St., MOORGATE, E.C.2.**

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Increase your signal strength and really enjoy your Broadcast.

Ask your Dealer for the "BRONEL" or send P.O.O. value 5/- to—

### TECHNICAL NOTES.

(Continued from page 1014.)

comparatively loose at the other end, as this prevents any buckling due to the heat. One of the holes in one of the end plates should also be made slightly elongated, that is to say, in the form of a short horizontal slot instead of a round hole; this allows for a certain amount of play in the horizontal rod.

The nozzle of the gas burner tube is put back from the row of burning holes, in order to provide a mixing chamber for the gas and air, and so prevent the flame from striking back.

#### Iron in H.F. Transformers.

Several readers have inquired lately as to the effect of iron in the core of a high-frequency transformer, and as to whether the iron is an advantage if it is introduced in the form of finely divided particles. The principal effect of iron in the circuit is to broaden the tuning, that is to make the set less selective. Of course, the presence of iron in the core tends to increase the efficiency. As regards the use of iron in the

form of very fine wires, or as finely divided particles, this has already been done; in the case of the iron filings or small particles, these may be mixed up into a paste, and the resulting mass moulded into any particular shape which may be desired.

Finely divided iron has also been used in the making of low-frequency transformers, and has the manufacturing advantage that the core can be "poured" in after the windings have been assembled into a suitable container, the iron particles finding their way into all the remaining spaces, and so forming a complete magnetic circuit. Various patents have been taken out from time to time relating to this method of forming the magnetic circuit of the transformer, and various methods have been proposed also for insulating the iron particles from one another. None of these comminuted-core transformers seems, however, to have found any permanent place on the English market.

### PHOTOGRAPHS.

Readers are invited to submit photographs of wireless interest for publication in "Popular Wireless." Every photograph accepted and published will be paid for at the rate of 10/6 per photo.

### Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

#### THE SUPER-SELECTIVE SET.

The Editor, POPULAR WIRELESS.

Sir.—Am enclosing herewith diagram of switching for the "super-selective" circuit, in the hope that you may consider it useful to other constructors.

As will be seen, any of the valves can be cut out of use without any alterations whatever to the set, this being particularly useful when only one L.F. valve is required.

The three switches are as follows:

(Left-hand (Right-hand position) (position)

(a) H.F. or D. = 4-pole double-throw.

(b) D. or L.F. = 4-pole double-throw.

(c) 1 L.F. or 2 L.F. = Double-pole double-throw.

It is suggested that "anti-capacity" switches be used, especially in the H.F. position.

A further point is that a 001 fixed condenser has been inserted between the two top right-hand terminals of the D. or L.F. (D) switch, to enable a condenser being across the 'phones (or loud speaker) when the switch is in the L.F. position.

Provision has also been made for the use of separate grid bias, to enable a power valve to be used at valve three, if two stages of L.F. are not required.

If the potentiometer is not required, the end of the coil should be taken to negative L.T. (original diagram, "P.W.", 25-4-25).

The switch (D), at H.T. negative to L.T. battery, whilst allowing the H.T. battery to be switched off when not in use, also enables the H.T. negative to be taken either to the positive or negative of L.T. battery.

("P.W." of 17-1-25 = D. and 2 L.F.; shows H.T. negative to L.T. negative).

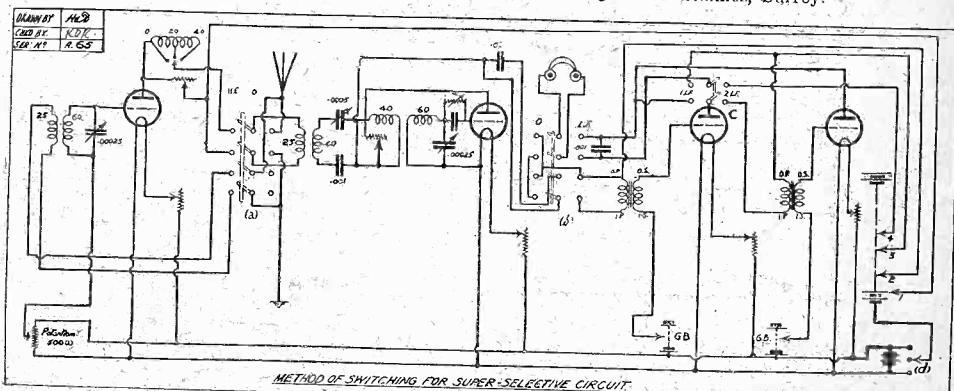
"P.W." of 10-1-25 = Det.; shows H.T. neg. to L.T. pos.

"P.W." of 28-2-25 = Det.; shows H.T. neg. to L.T. pos.

"P.W." of 25-4-25 = H.F. and D.; shows H.T. neg. to L.T. pos.

Yours faithfully,  
L. J. CRISP.

The Barracks,  
Kingston-on-Thames, Surrey.



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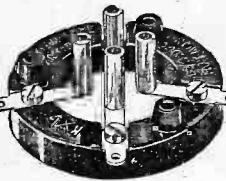
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## Richer Music, Safe Valves, No Microphonic Noises.

Improve valve reception in three ways at the cost of three shillings. You will lengthen the life of your valves, gain signal purity and strength, and prevent all microphonic noises when you fit them in "Antipong" Valve Holders. Valve legs supported on Phosphor Bronze springs save your valves from accidental strains and make Dull Emitters non-microphonic. Air insulation reduces all



losses to a minimum and so makes this holder ideal for short wave reception.

"Antipong" is designed for universal fitting—it can be used in any type of receiver.

The springs are attached to a Bakelite Ring that will not melt under the soldering iron.

"Antipong" will improve reception with Dull or Bright Emitters. Order it to-day from your dealer. Fit it in all your sets.

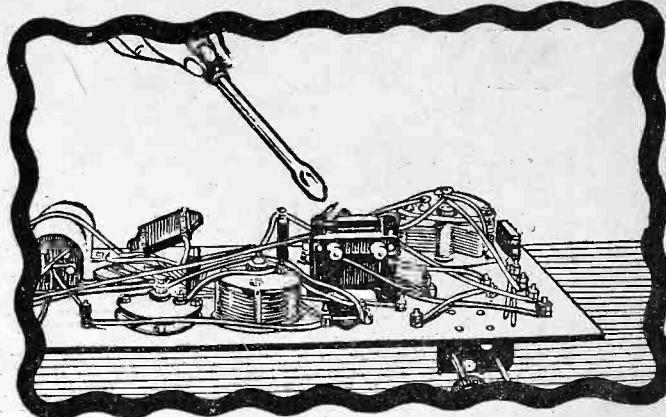
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Your Soldering-iron  
can't burn or melt

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REGD.

THE NEW COLOURED CONNECTING WIRE

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"Glazite" Connecting Wire is already insulated and is flame-proof. "Glazite" consists of tinned copper wire, first covered with cotton and then with a film of heavy insulating material.

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**PRICE 1/2 PER COIL**

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Made in four different colours; Red, Blue, Yellow and Black. Obtainable from all radio dealers.

"GLAZITE" NOW PACKED IN 2 FEET LENGTHS (1/16 S.W.G.) for the convenience of amateurs constructing one- or two-valve sets, four lengths in an envelope (one length of each red, blue, yellow and black). Price 1/- per packet.

Send P.C. for "Glazite" leaflet and the name of nearest dealer with stock.



GUARANTEES QUALITY.

THIS MARK

## FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.

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All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4 & 2/8.

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JUDD.

# LISSENIUM

## Is Daventry Interfering with you?

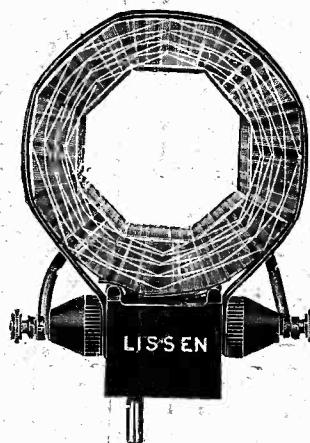
Are you finding Daventry a source of interference?  
Does it prevent you tuning in Radio-Paris?  
Is it even so near as to interfere on the lower wave-lengths?

The remedy is to increase the selectivity of your receiver. You will naturally wish to do so with as little alteration as possible to your existing receiver and without complicating the tuning.

Do you find it a problem? The solution is the use of a LISSENAGON X COIL.

In many receivers a LISSENAGON X COIL can be used to increase the selectivity without any alteration to internal wiring or additional parts. Simply plug a suitable LISSENAGON X COIL into the aerial coil holder in place of the usual coil and connect the aerial to one of the terminals on the side of the coil mount instead of to the usual terminal. Try both terminals on the coil and use the one which is found the better. See that the earth is connected to the socket of the coil plug. Tuning is carried out as usual with the aerial tuning condenser.

LISSENAGON X COILS can also be used in the H.F. circuit and give remarkably sharp tuning; usually it is only necessary to alter one connection in order to



### LISSENAGON X COILS.

No. 50	..	..	6/-
No. 60	..	..	6/4
No. 75	..	..	6/4
No. 250	..	..	9/9

Interesting Leaflet describing the uses of LISSENAGON X COILS will be sent free on request to all readers of this magazine :

obtain much greater selectivity than with a standard coil,

LISSENAGON X COILS are particularly suitable for use in Neutrodyne and Reinartz Circuits.

LISSENAGON X COILS possess all the characteristics which have made standard Lissenagon Coils so much demanded by all experimenters—maximum inductance, minimum self-capacity, lowest possible H.F. resistance and great air space between windings. Although the tappings of the LISSENAGON X COILS make them suitable for special purposes they are, in other respects, similar to standard coils and can be plugged in instead of them in any circuit without any alteration of any kind.

Hold a LISSENAGON COIL to the light—see the great air space right through it

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