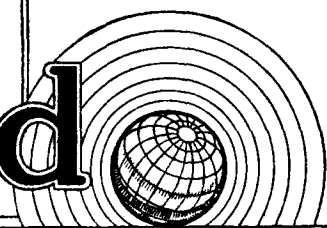
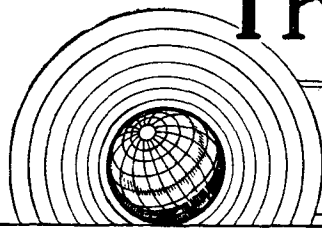


The Wireless World

THE
PRACTICAL RADIO
JOURNAL
23rd Year of Publication



No. 749.

FRIDAY, JANUARY 5TH, 1934.

VOL. XXXIV. No. 1.

Proprietors: ILIFFE & SONS LTD.

Editor:
HUGH S. POCOCK.

Editorial,
Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1.

Telephone: Hop 3333 (50 lines).
Telegrams: "Ethaworld, Watloo, London."

COVENTRY: Hertford Street.
Telegrams: "Cyclist, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:
Guildhall Buildings, Navigation Street, 2.
Telegrams: "Autopress, Birmingham." Telephone: 2970 Midland (3 lines).

MANCHESTER: 260, Deansgate, 3.
Telegrams: "Iliffe, Manchester." Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Renfield Street, C.2.
Telegrams: "Iliffe, Glasgow." Telephone: Central 4857.

PUBLISHED WEEKLY. ENTERED AS SECOND
CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:
Home, £1 rs. 8d.; Canada, £1 rs. 8d.; other
countries abroad, £1 3s. 10d. per annum.

*As many of the circuits and apparatus described in these
pages are covered by patents, readers are advised, before
making use of them, to satisfy themselves that they would
not be infringing patents.*

CONTENTS

	Page
Editorial Comment.. ..	1
Programmes from the Near East ..	2
The Piezo-Electric Loud Speaker ..	5
Unbiased	7
Magnetic Recording and Repro- ducing	8
Adjusting Band-Pass Filters ..	11
FOREIGN PROGRAMME	
SUPPLEMENT, pp. 1—XXIV.	
News of the Week	13
Broadcast Brevities.. ..	14
Power-Grid Detection for Battery Sets	15
New Apparatus Reviewed.. ..	16
H.S.P. Auto-radiogram	17
Readers' Problems	18

EDITORIAL COMMENT

The Wavelength Change Order Next Week's Issue Early

IN next week's issue the change-over of European broadcasting station wavelengths will form the chief topic of interest. The issue will carry with it as a free supplement a novel "key" to the new wavelengths, printed in colour on a large card which will provide a record of station tuning positions for the future, as well as a guide to the identification of the new wavelengths as the change-over takes place.

This special supplement can only be made available with copies of *The Wireless World* and cannot be obtained separately. As the issue is likely to prove very popular, it would be well for readers and their friends to make sure of obtaining next week's issue by ordering it in advance from their newsagents.

would do all in their power to rectify it. We are glad, therefore, to be able to report that investigations have been made by systematic listening by the B.B.C. engineers, as a result of which they have satisfied themselves that although background noise of one programme behind the other is present at times, it is no more prevalent now than has always been the case.

They find that there is not a continual background of one programme behind the other, but that it does occur very occasionally. It is extremely difficult to eliminate, arising as it does from cross-talk due to unusual line adjustments. We are assured that the investigations will continue, with the object of eliminating all suspicion of cross-talk in the future.

No doubt the B.B.C. engineers would be glad to receive further reports from readers who observe this trouble, and will be assisted in their task if such co-operation is forthcoming.

Background Mystery

The B.B.C. Investigates

WE drew attention in our issue of December 1st to letters which we had received from readers complaining of the frequent presence of a background of speech or music behind one or other of the Brookmans Park transmitters. These letters, for the most part, came from readers who obviously had a good technical knowledge and wide experience and were well aware of the effects produced by cross-modulation, so that we felt fairly confident that some other explanation had to be found for this irritating phenomenon.

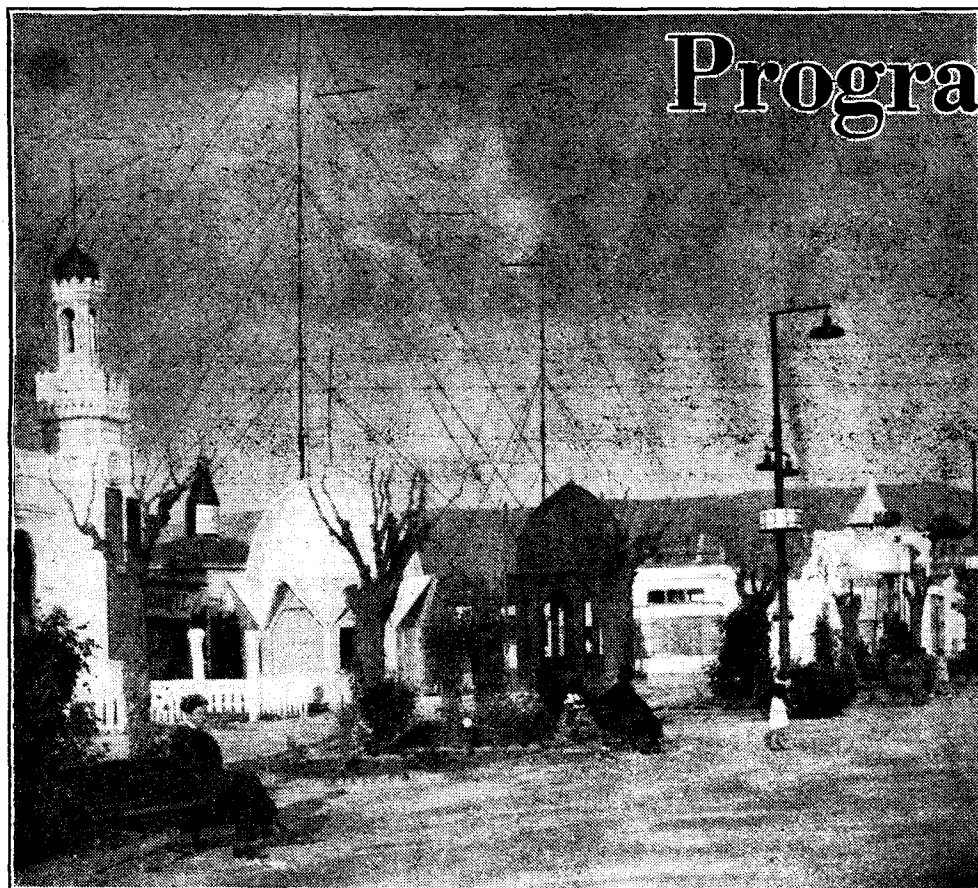
We suggested that the B.B.C. engineers should look into the matter, with a view to eliminating the trouble. We had little doubt that the engineering staff of the B.B.C., as soon as they appreciated that something was amiss,

News from the East

Big Increases of Power Expected

ALTHOUGH most of our readers are only too well aware of the "race for power" among European broadcasting stations, it will come as news that the epidemic is spreading to the Balkans, including Turkey. The discoveries made by our Special Correspondent, Mr. Cecil W. Lusty, during his recent tour to Constantinople, and related in this issue, show that the East is tardily awaking to the full possibilities of broadcasting.

Whether the new power urge will be welcomed by the already harassed International Broadcasting Union is debatable, but there can be little doubt that the British listener will welcome the new and unusual programme material which is promised for the near future.



Programmes from the Near East

By CECIL W. LUSTY



COMING SHORTLY

Angora (Turkey)	-	-	150 kW.
Brasov (Roumania)	-	-	150 kW.
Sofia (Bulgaria)	-	-	50 kW.
Belgrade (Yugoslavia)	-	-	50 kW.
Athens (Greece)	-	-	50 kW.

The company, I found, receives 65 per cent. of the licence revenue—of Yugoslavia's 55,000 licensed listeners about 11,000 are in and around Belgrade—and the Government the remaining 35 per cent. But as the company also conducts the technical side of the service it is asking for its proportion to be increased to 80 per cent. The desired increase would naturally result in a higher standard of programmes and probably extended broadcasting hours.

Untapped Talent

Radio Belgrade is usually active from 11 a.m. to 1.45 p.m., 4 p.m. to 5.20 p.m. and 7 p.m. to 11 p.m. or midnight (Central European Time). The musical director, M. Petar Krstic, kindly prepared for me an analysis of his programmes, and, on broad lines, the time is divided as follows: Music, 67.3 per cent.; literature, 2.7; talks, 6.2; criticism and news, 11.1; religion, 3.6; relays, 9.1. I



Radio Belgrade, in the Knez Mihailova, will soon be replaced by a 50-kW. station.

Giant Transmitter Plans in the Balkans

"GO East," said the News Editor, and I went. "Storm shirts" at German radio stations, barbed-wire entanglements in Switzerland, suspicious Austrian gendarmes at Bisamberg . . . these remained but a memory as I hastened to the Danube, storied river of song, where rises beautiful Budapest, pride of the Magyars, great capital of Hungary, and gateway between the Occident and my "Promised Land."

A pigmy-like figure clung precariously to the swaying Budapest radio tower that bestrides Central Europe like a Colossus, and gazed around. Westward lay the great cultural centres of Rome, Vienna, Prague and Berlin, whose programmes come at good strength to our British firesides, but ever eastward rolled on the majestic Danube beckoning to lands uncharted by most English loud speakers.

Gusts of wind made my descent difficult, but I reached the ground safely.

Budapest's fascinating illuminations

faded as the impudent little paddle-boat fussed down the misnamed "Blue" Danube to Belgrade, capital of Yugoslavia. The directions given me for the radio station, Knez Mihailova, were somewhat hazy. However, using my *vade mecum* *Wireless World* as a breast-plate, I was finally piloted to the station.

THE author of this vivacious and informative article has just returned after a radio pilgrimage from London to Constantinople. The trek was made in order that "The Wireless World" could confirm recent rumours concerning broadcasting developments in the Near East which bid fair to provide British listeners with new and unusual programme material. Mr. Lusty's disclosures of the new high-power plans are exclusive to this journal.

I rejoiced to find that the voice of Yugoslavia will later be well heard in the British Isles. M. Le General Kalafatovich, the courteous director of the service conducted by the Radio Belgrade A.D. Company, which is 98 per cent. British owned, told me that the concern had embarked on a £100,000 broadcasting scheme. The

present 1928 2.5-kW. station, which has received reception reports not only from English *Wireless World* readers, but also from Scandinavia, California, Africa and India, is being replaced by a modern 50-kW. plant on flat rural land about eight miles south-east of Belgrade. The two 100-metre masts were nearing completion when I visited the site, and I was informed that the station would be "on the air" towards the end of 1934. Mine Host also told me that 6-kW. relay transmitters would be established at Skoplje and Sarajevo. The existing Belgrade transmitter will be transferred elsewhere.

The title picture is of the amateur 1-kW. station in the fair grounds at Salonika, which is the precursor of a 50-kW. transmitter to be installed later by the Greek Government at Athens.

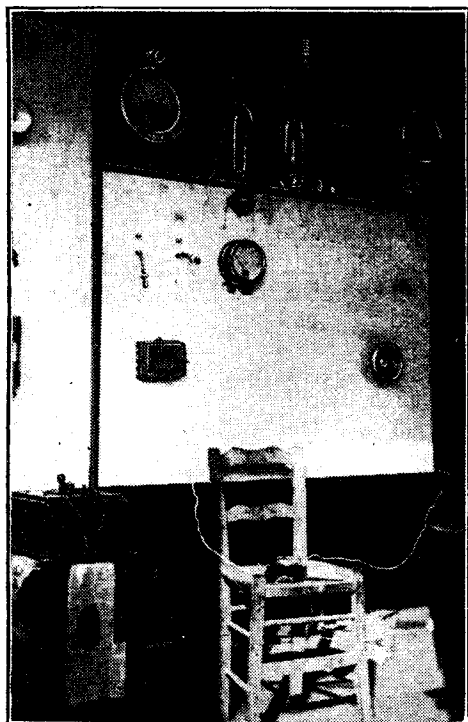
Programmes from the Near East—

discovered permanent relay lines to the cathedral, Opera House, University, Concert House, etc., while there is a radio orchestra of 16 players.

The present programmes are of a very encouraging nature, and with the new radio house put in order I can predict some interesting broadcasts for English enthusiasts, as there is vast musical talent in the land of the Slavs yet untapped by radio.

Bulgaria is Ambitious

The aeroplane unloaded me at the pleasant university city of Zagreb, and I found "Radio Zagreb" above the cable tram system connecting the old and the new town. I learned that the present 0.75-kW. station, built in 1926, would be superseded by a 20-kW. transmitter. This is being constructed near the river Sava, a few miles from Zagreb, and will be ready about the same time as Belgrade. The

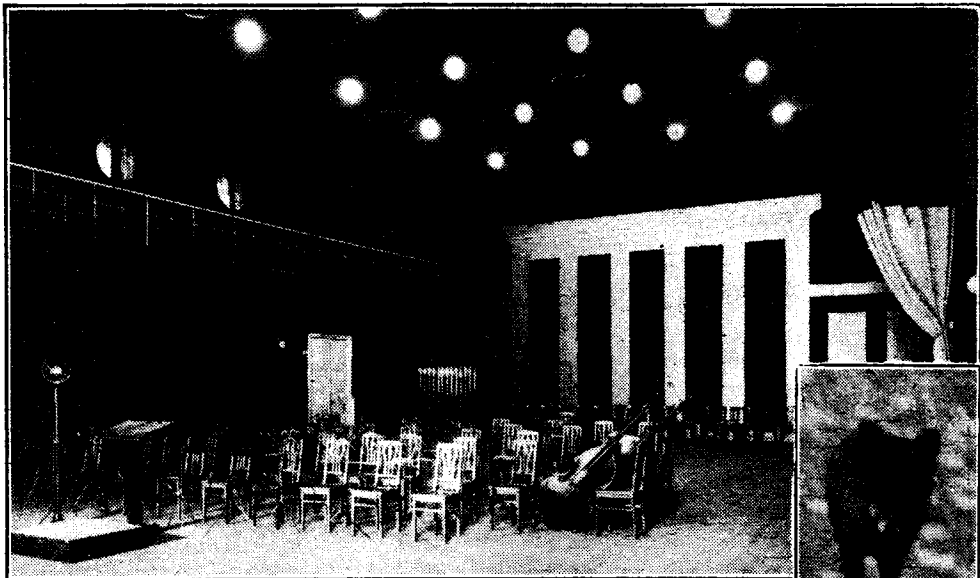


The little 1-kW station at Salonika with which Greek amateurs are "keeping the pot boiling" until the opening of the 50-kW transmitter at Athens. The station staff are seen on the right.



old plant will be given marching orders to Split, on the Dalmatian coast, to serve as a relay. The station at Ljubiana, the Yugoslavian Salsburg, was increased to 7 kW. last year.

The Simplon Orient express shunted me the following day into Sofia, the little capital of Bulgaria, and reputed to contain as many barber's shops as Birmingham. Eventually I was guided to Rodno Radio,



The Bucharest studio has the authentic Western European atmosphere. On the right is the station mascot.

in Benkovska Street, off the boulevard Dondoukoff.

Radio in Bulgaria can be described as "pale but interesting." The present existing transmitter, one of 350 watts, made its debut in 1930 and is maintained by the Bulgarian Society of Radio. This society, however, is now a house divided against itself, having split into two factions. One group, Bolgarsko Radio, a cultural co-operative society, wishes broadcasting to be independent of the State, but the principal Rodno Radio League is opposed to private monopoly. The former group advised me that they planned to erect a 4-kW. transmitter in a central position and subsequently to build relay stations in the east and north of Bulgaria and around Sofia.

At the Foreign Ministry I was officially informed of the Government's intention to install, in 1934, a 50-kW. transmitter to the east of Sofia.



I was pleased to hear from Rodno Radio—one of the most enthusiastic amateur corps I have met in my extensive travels—that, in order to foster radio-mindedness, they are not waiting for the State station, but are building a 3-kW. plant in the suburbs. My trip to this small station under the frowning heights of Mount Vitoshka was highly interesting. The engineer, M. Hugel Tchoutchouloff,

told me that the two 65-metre masts, formerly used at the commercial transmitter behind the railway station, were presented by the Minister of Public Works, who also gave the bricks for the building and the machinery. An amateur working bee is in full swing and the cost to the society will be only 500,000 leva (about £735 at par). This plant will be testing early in 1934. The Government station, which will cost 40,000,000 leva (approximately £58,824 at par), will be devoted to national programmes, the 3-kW. plant to local programmes, and the pioneer 350-watt station, after conversion into a 500-watt transmitter, will be removed as a relay broadcaster to Varna, "Queen of the Black Sea."

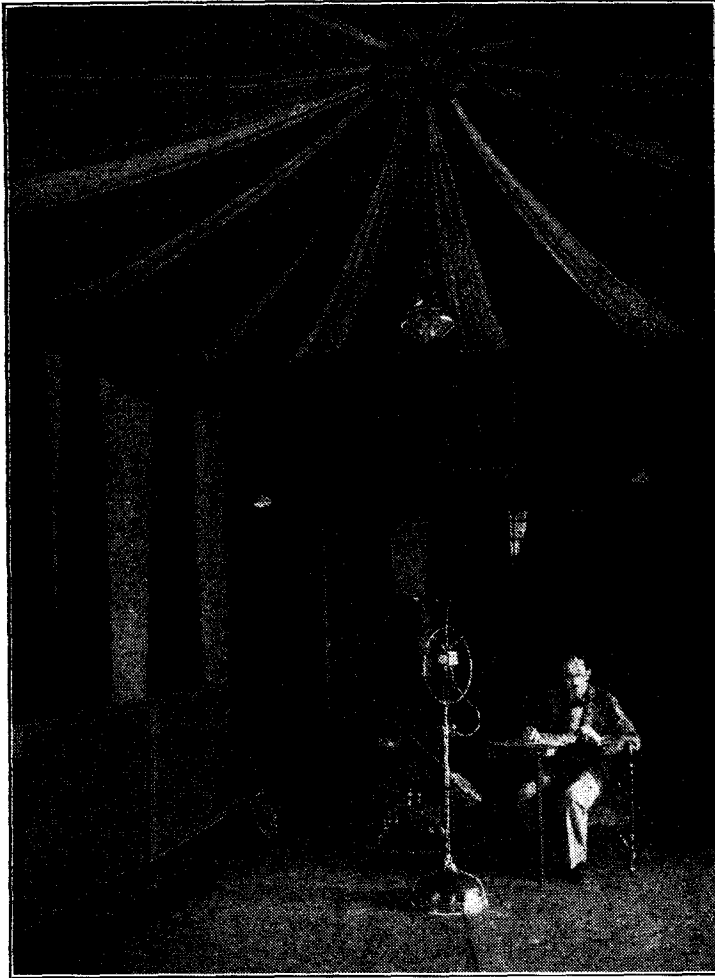
"Writtle" Days in Sofia

As the Government pockets the whole of the licence revenue and Rodno Radio is dependent financially upon minor advertising and members' subscriptions, the programme material at its command is restricted. (My mind travels back to our own Writtle days!) Relay lines, however, connect with the cathedral, Parliament, etc., while—unusual for this commercial age—artists give services gratis! Bulgaria, I learned, has about 4,000 licensed listeners, and there is a sliding scale of fees. With the arrival of the promised national station we should at least hear a new type of broadcast fare. Radio in Bulgaria being in its infancy, I expect it would be some time before the future State service could compete in programme building with the maturer organisations in other countries. Bulgarian national music, preserved in spite of black centuries under foreign yokes, is highly original and entertaining.

Through the rugged Balkan mountains, across the frontier Danube, and so to Bucharest, the modernistic city that has risen, Phoenix-like, on the war ashes of

Programmes from the Near East—

the old capital. By imitating the action of playing a violin I was sufficiently understood to be escorted to the palatial offices and studios in the Rue General Berthelot, and after presenting my credentials to the guardian and mascot—a



An exclusive photograph of the Stamboul studio, with the announcer, Dsemil Bey, reading the news bulletin. Turkey promises 150-kW. transmissions for Western Europe in the near future.

lively little fox—I was given the freedom of the station.

Roumania's 150-kW Station

Roumania, I discovered, has a "five-plans-in-a-year" scheme. Ing. G. Munteanu, the obliging chief of this most progressive company, the Societatea de Difuziune din Roumania, 60 per cent. of the shares of which are owned by the State, revealed to me the full details of the ambitious project. A giant 150-kW. transmitter will be constructed near Brasov (the contract has been given to a British company) and will join the ether kings next autumn; the present 12 kW. Bucharest station will be "pepped up" to 20 kW.; and 20-kW. plants will be erected at future dates at Chisinau, in Bessarabia, Cernauti, the Bucovina, Cluj, Transylvania, Timisoara, the Banat, and Tazi. The nearly completed 20-kW. experimental station at Brasov, which under the Lucerne Plan has the longest wavelength in Europe, will be transferred to one of the relay sites.

I am also able to disclose that the mammoth 150-kW. transmitter will radiate international programmes, which will be received by Roumanian nationals in other countries; the Brasov station (temporary site only) will be a national transmitter, and its musical programmes will be relayed by Bucharest and the other 20-kW. broadcasters, which will also "put out" their own regional talks.

Broadcasting in Roumania has been on an organised basis since 1928, and consequently, I was not surprised at the splendid standard of the service. The present transmission hours (Eastern Standard Time) are from 1 p.m. to 2.30 p.m., when gramophone recitals, news and market reports are given; 6 p.m. to 7 p.m., orchestral performances, news and lectures; 7 p.m. to 8 p.m., Radio University; and 8 p.m. to 11 p.m., records, vocal and instrumental, comedies, opera, concerts and cabaret relays. Bucharest has a radio orchestra of 36, and really has excellent talent to draw upon. Relays of sports, important functions, and of Vienna and Budapest figure in the broadcasts. The company, I learned,

receives 70 per cent. of the varying licence fees and the State 30 per cent. Advertising is conducted between items.

Before hitting the eastward trail again I went by taxi one night along the magnificent Chaussee Kissaloff to the Bucharest transmitter. Scarcely had I alighted at the station entrance when I was assailed by the Hounds of Bucharest, a troupe of savage watch dogs. The engineer explained: "Soldiers can be bribed or intoxicated, but our 12 dogs are MOST reliable guardians."

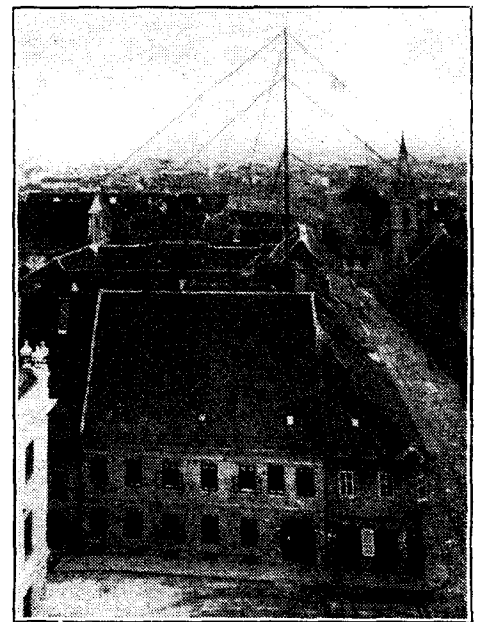
A ship took me through the Black Sea and the Bosphorus, to Stamboul, former capital of Turkey, and an incongruous spectacle of old and new. The game of "hide and seek" ended in my locating the studios of the Telefon Sirketi in the post office in the Rue Meydancik, Stamboul. The director, Hayrettin Bey, cordially welcomed me, and outlined the history of broadcasting in the Republic. The 5-kW. Stamboul station, I learned, came into being about 1925, and the 7-kW. plant at Angora about 1928. I was also informed that the Turkish Government had an-

nounced its decision to build a 150-kW. transmitter at Angora to serve as the mouthpiece of the Republic, and that the existing Angora broadcaster would be transferred to a relaying site. The contract for the new national station has not yet been signed. When completed, it should be well picked up in England, and listeners will hear more of the peculiar eastern music which, in spite of its wailing and somewhat monotonous strain, is always fascinating to the Western mind.

Programmes from Athens

From the minarets of Stamboul and the Golden Horn my Odyssey took me across the Aegean Sea, rich in mythological associations, to Salonika, principal centre of Thessalonica, Greece. Here I found a blank expression to be the best "lingo," and I was speedily in touch with the Association des Sans Filistes Saloniciens. As in Bulgaria, I found another band of ardent amateurs, who, in the absence of an organised service, conducted their own little station. The 1-kW. plant, which, I learned, has been heard in Central Europe and even England, is situated in the September Fair grounds, and I was shown over the station by the engineer and speaker, M. Tsingueridges. The station, I was informed by the president, M. Minas Orologas, broadcasts records and music every Saturday from 9 p.m. to 11 p.m. (Eastern time). The Greek Government, I found, intends to construct a high-power station of at least 50 kW. at Athens, and several relay stations. Upon investigating the position at the Ministry in Athens I learned that the foreign company given the concession had failed to carry out its obligations, and that the State is now negotiating with a British company.

The fairy lights of Le Piree, romantic port of Athens, the brooding cliffs of the Corinth Canal, sun-gleaming Adriatic waters, the gardens of Italy, gay and noisy Paris—and then back with my exclusive story to Dorset House.



Radio Zagreb uses a power of only 0.75 kilowatts, but will soon be superseded by a 20-kW transmitter.

The Piezo-Electric Loud Speaker

First Details of Production Models Now Available in This Country

MORE than one unit is required to cover the band of frequencies required for faithful reproduction of speech and music, and for domestic use a diaphragm type moving-coil loud speaker in conjunction with a special unit for the extreme top offers the best solution. The piezo-electric loud speaker is especially suitable for the latter purpose and in the near future is likely to be widely adopted.

IN the march of progress towards high quality of reproduction the improvements in loud speaker design have lagged behind those of amplifiers and other sections of the receiving equipment. The moving-coil principle has probably contributed more than any other to the standard which has so far been reached, but there is general agreement that no single loud speaker is capable of reproducing uniformly the range of frequencies from 30 to 10,000 or 15,000 cycles which is required for really faithful reproduction.

If a large diaphragm is used to give an adequate output in the bass it is generally accompanied by serious attenuation of the high frequencies above 5,000 or 6,000 cycles, and, conversely, if a small diaphragm is designed to do justice to the region between 5,000 and 15,000 cycles, the amplitude required to produce an equivalent sound pressure at lower frequencies is impracticably large.

High-frequency Reproducers

The general trend of design, therefore, has been to use a large diaphragm moving-coil in conjunction with an auxiliary unit designed specially for the upper register. Special moving-coil units with miniature exponential horns have been used successfully, and the electrostatic loud speaker is also capable of giving good results if the requisite attention is given to the conditions in the output circuit. It would now

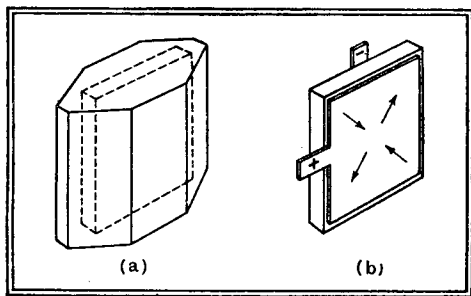


Fig. 1.—(a) A crystal of Rochelle salt showing the plane from which the active element is cut. (b) Under the influence of electric strain the crystal plate contracts along one diagonal and elongates along the other.

appear that the piezo-electric crystal loud speaker is destined to make an important contribution to the technique of high-frequency sound reproduction. The practical difficulties associated with the con-

struction of these units have been successfully overcome, and we understand that production models are now available in this country.

The piezo-electric effect was investigated in 1880 by F. and P. Curie, who discovered that certain crystal substances when subjected to mechanical strain developed electric charges on their surface. The converse effect was also observed, and it is the change of form due to the application of an electrostatic charge which is made use of in the crystal loud speaker. The effect is greatest in Rochelle salt (sodium potassium tartrate, $\text{NaKC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$).

The natural crystal is approximately of the form shown in Fig. 1 (a), and the active element is cut in the plane indicated by the dotted lines. When a difference of potential is established between opposite faces through the medium of foil electrodes, the crystal elongates across one diagonal and contracts across the other as shown by the arrows in Fig. 1 (b).

One method of utilising this deformation to drive a cone diaphragm is indicated in Fig. 2 (a). The lower edge of the crystal is fixed and the drive, which is parallel in direction to the lower edge, would be taken from either of the top two corners.

The amplitude obtainable in this way, however, is small, and better results are obtained by building up pairs of plates in the manner indicated in Fig. 2 (b). The polarity of the applied charge is opposite in each case, and if the two elements are cemented together the resultant strain causes the plates to bend in a direction at right angles to the plane of the foil electrodes, much in the same way as the bi-metallic strips used in recording thermometers and thermostats. When this type of unit is used three of the corners are clamped, and the resulting deformation is concentrated at one corner, to which the drive is attached.

Where it is desired to utilise the sound

energy radiated directly from the surface of the unit, as in the high-frequency horn type of loud speaker, four elements are cemented together with their active corners in the centre, as shown in Fig. 2 (c).

Preparing the Crystals

The production of Rochelle salt crystals of suitable size and the subsequent machining of the plates call for considerable knowledge and skill, and due credit

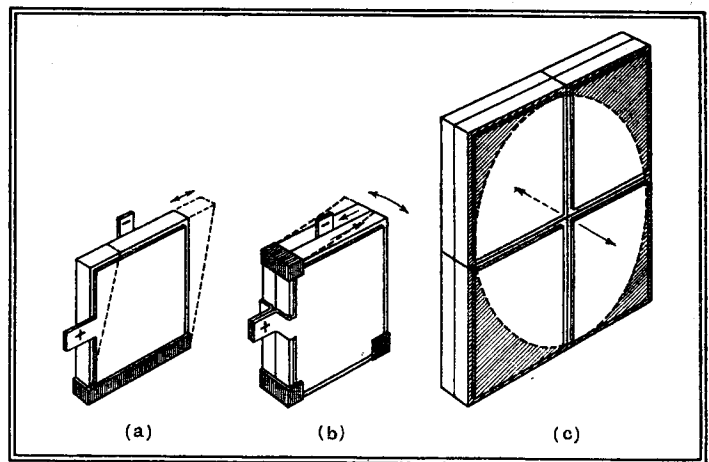


Fig. 2.—Methods of utilising the deformation of the crystal. (a) Direct lateral drive. (b) Bending of two elements cemented together with potential applied in opposite directions. (c) Composite diaphragm for horn type loud speakers.

must be given to the Brush Development Co., of America, for their success in overcoming the many obstacles to commercial production. Small and perfectly formed crystals are selected from a number obtained by evaporation, and are then "grown" in a saturated solution of the salt. The large crystals, which may be as much as 3in. or 4in. in diameter, are then treated to remove any excess of the "mother liquor," after which they are machined into plates of the order of $\frac{1}{16}$ in. thickness. The development of the right type of cutting tools is in itself no mean achievement, for the salt is not unlike washing soda in its mechanical properties, and in the early stages the only method of cutting available was to wear through the crystal with a wet string.

After the unit is finally assembled it must be completely sealed with a coating of waterproof varnish, but care must be taken to avoid scratches which might later permit the ingress of moisture.

The Piezo-electric Loud Speaker—

Through the courtesy of the Rothermel Corporation, Ltd., we have recently had the opportunity of testing one of the diaphragm type loud speakers. This is the model R95, and it is shown in combination with a Sonochorde permanent-magnet moving-coil loud speaker in Fig. 4. The driving element is built up of four laminations, approximately $2\frac{1}{2}$ in. square, the total thickness being $\frac{1}{4}$ in. A sketch of the assembly with the cover removed is shown in Fig. 3. The rubber pads at

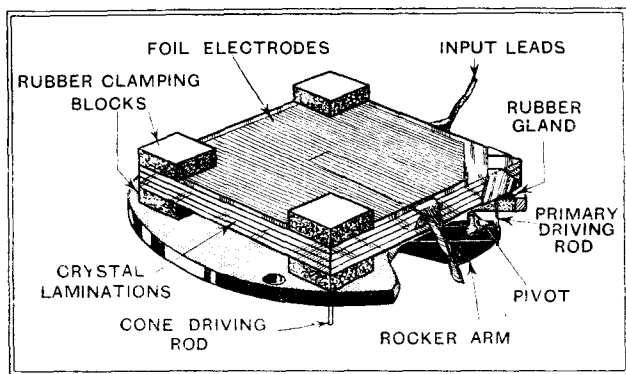


Fig. 3.—Constructional details of the Type R95 crystal unit in conjunction with a Sonochorde permanent-magnet moving coil.

three of the corners are clamped between the cover and the base plate, and a critical pressure is applied to obtain the maximum efficiency. The drive is transmitted from the free corner of the plate by means of a short rod, which passes through a rubber gland in the base plate to one end of a light and rigid lever, designed to increase the amplitude of vibration at the cone apex.

We were particularly impressed with the efficiency of the unit, which is comparable with that of some of the best moving-iron types which were in vogue at one time. The lower and middle register is quite good, but the unit excels in the region from 2,000 to 8,000 cycles. In combination with the moving coil, it gave better reproduction than we have previously heard from commercial dual moving-coil units, and even when used in conjunction with one of the larger and more expensive energised moving coils a very definite improvement in quality resulted. No

D.C. current in the primary winding does not appear to affect the functioning of the crystal, which has this advantage over the electrostatic loud speaker that it does not require any initial D.C. bias voltage. The electrical characteristics of the crystal loud speakers are similar to those of a condenser, and in the case of the R95 unit the equivalent capacity is of the order of 0.03 mfd.

In addition to the unit described, the makers also market a larger model incorporating four motor units linked together through a system of levers to drive a 12 in. cone, and it is claimed that good response is obtained from 7,500 down to 30 cycles. There is also a special horn loud speaker designed for the range from 3,000 to 15,000 cycles, and we hope to be in a position to report on the performance of this unit at an early date.

In conclusion, it is interesting to note that the application of the piezo-electric effect to loud speaker design was suggested in the pages of this journal as far back as 1923, when, in a report of a demonstration at the Institution of Civil Engineers, the following comment was made:—"The crystal also acts as a high-impedance telephone transmitter. On account of its high impedance it is particularly suitable for measuring sound waves in what may be called high-impedance media, such as water. . . . The crystal may also be used as a high-impedance telephone receiver.

"The phenomenon is extremely interesting, but probably a definite commercial application has yet to be found for it."

At the time these notes were written the piezo-electric effect was only of interest as a scientific novelty, but it has since proved an invaluable tool in any investigations requiring the measurement of rapidly varying pressures such as are to be found in internal-combustion engines and in the development of explosives. The applica-

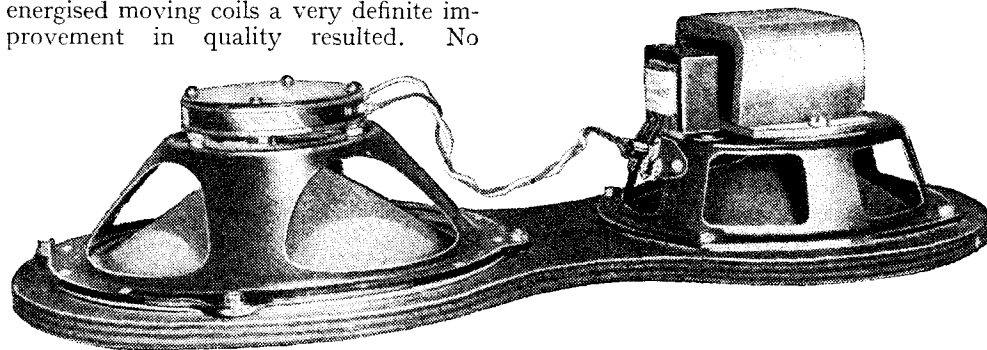


Fig. 4.—Dual loud speaker consisting of the R95 crystal unit in conjunction with a Sonochorde permanent-magnet moving-coil unit.

special precautions were taken to ensure correct matching, and the crystal unit was connected directly across the primary winding of the moving-coil output transformer. The polarising voltage due to the

tion of the effect to loud speakers and microphones has only been delayed by the difficulties, now happily removed, of producing homogeneous crystal plates of sufficient size.

SHORT-WAVE WORLD

THERE have been distinct indications of an improvement in the general level of short-wave reception conditions, and during the past fortnight some of the American stations have been particularly reliable. It seems, however, to be an unfortunate fact that reliability and good signal strength seldom go together.

Bound Brook, W3XL, on 46.69 metres, has been one of the best North American stations, and it has been possible to "hold" his programmes for three or four hours from 11 p.m. onwards. Fading curves plotted on this station between midnight and 2 a.m. on three occasions showed an average level of R7; during all three periods the transmission only sank below R5 for a total time of four or five minutes.

When this degree of consistency is reached, short-wave stations are really worth listening to. Unfortunately one can rarely maintain such results for more than seven or eight consecutive days, after which period the fading often becomes of the "R9 to R2" variety, the R9 periods failing to compensate for the much more lengthy spells of R2.

North American Reception

Anyone with a reasonably efficient short-wave receiver ought to be able to log six or seven of the North Americans between 45 and 50 metres. The best, in order of merit, as logged in South London during December, appear to be W3XL, W3XAL (49.18), W8XK (48.86), W4XB (49.64), W3XAU (49.5) and W2XE (49.02).

The 31-metre band seems to be devoid of anything interesting except on Sunday mornings, when Sydney (VK2ME) is usually very good. He has been held until as late as 11 a.m. at times, but his peak usually occurs at 7 or 7.30 a.m. The various Brazilian stations, many of whom work just above the actual 31-metre broadcast band, are quite interesting to listen to, but one often has to wait so long for identification that they are passed over unrecognised.

The Best South Americans

South America is certainly very well represented on the short waves, and it is possible to log stations in eight or nine different countries. Ecuador has two very reliable stations in HCJB (37.04 metres) and HC1DR (47 metres), both being located in Quito.

The best Colombian station at the moment is Bogota, HJ3ABF, on 47.97, and the Venezuelan stations are so numerous as to be quite confusing, especially as they appear to change call signs and wavelength with bewildering frequency. Maracay (YVQ) is at present on 44.96 metres, Caracas (YV1BC) on 49.08 metres, and a new station with the call YV14BC on 49.2 metres. The latter uses an input of 15 watts, and has already been logged in this country!

Very few owners of short-wave sets have ever heard Bolivia. They have a chance during January, when the La Paz station CP5 will be working daily on 49.3 metres, relaying the long-wave programmes from station CP4.

No times have been mentioned for the above stations, but they are all active between 6 p.m. and midnight, local time, which means that most of them should be heard between 11 p.m. and 5 a.m. in this country.

MEGACYCLE.

UNBIASED

BY FREE GRID

Daylight Law-breakers

IN the course of a somewhat busy life I have come across many instances where the law has been flagrantly flouted, but none, I think, so glaring as that which came to my notice the other day. Strangely enough, the offence was committed under the very noses of those who are supposed to enforce the law.

The instance to which I refer occurred some weeks ago on the occasion of a public procession in London. As the event is now stale news, it would be a breach of journalistic etiquette to state what it was.



Engrossed in my lesson.

In order to view the procession, I took up my position on the kerb and was soon encompassed about by garrulous females. Indeed, I was glad that I had brought along my vest-pocket portable, which served the treble purpose of shutting out the horrible cackle of tongues, of providing me with the wherewithal to wile away the time until the procession came along, and of giving me a certain amount of moral uplift, for I tuned in to the transmission for schools in order to be instructed in the proper use of King's English.

Just when getting engrossed in my lesson I became conscious of irritating morse interference steadily growing in intensity. It appeared to spread all over the tuning dial and was absolutely unescapable. As it became louder and louder it suddenly occurred to me that it must be emanating from the procession, and this I swiftly proved by using the frame in my portable as a direction finder, and then consulting the map of the procession-route printed in my morning paper, which also gave the times at which the cavalcade would pass certain spots.

Immediately I gained a certain amount of kudos among the crowd by announcing from time to time exactly where the procession was; indeed, it became somewhat embarrassing in the end, as several women among the crowd thought that I possessed powers of an occult nature, and eagerly pressed money upon me with the demand that I cast their horoscopes. Fortunately I was saved from an awkward predica-

ment by the arrival of the advance guard of the procession.

I very soon found out the source of the morse interference. In the procession was a large waggon carrying a 1934 wireless transmitter at one end and one of 1901 vintage at the other, the idea being to demonstrate radio progress since the beginning of the century. Naturally the 1901 instrument consisted of an old ten-inch spark coil and the usual accessories. Although the modern instrument was dumb, the ancient static-generator was actually being worked by an operator, who was got up to look as antique as the hook-up he was using.

Thousands of listeners must have had their enjoyment spoiled just for the sake of amusing the mob with a few pretty sparks. The crowning piece of insolence, however, was that this deliberate law-breaking was going on within a stone's throw of one of the famous Post Office radio vans. Needless to say, I am preparing a full and picturesque report to be sent to the proper quarter.

Thicker Paper, Please

MY correspondence bag has been unusually heavy lately, and while I do not want to appear to be of a complaining nature, I do wish that correspondents would make use of a better grade of notepaper.

In pursuance of my policy of having everything in my set home constructed I am at present engaged in making up the necessary fixed condensers for my latest receiver, but I find most of the letters in my post bag break down at an extremely low voltage, and, indeed, the dielectric properties of the correspondence as a whole are deplorably poor. I trust that those who write to me will see fit to remedy this defect. As it is the paper is too thin for high voltage condensers.

While on the subject I may mention that judging from the extraordinarily large number of my correspondents who have of late been seeking my advice on what sets they ought to build or buy, my readers are evidently under the delusion that I am in the habit of buying or building every set that appears, whether commercial or otherwise. Sometimes I can help, but more often I fear that the reverse is true.

It would help greatly if only my readers would all send me a full report giving their candid opinion of such sets as they may have been inveigled into building or buying. I could then at least get together a very comprehensive directory of unvarnished reports, and send copies out to any correspondent who happened to enquire about a set which I had in my collection.

Radio Course for Pinheads—II

I AM greatly indebted to one of my more advanced readers, who has kindly supplied Lesson II of my recently started Radio Course for Pinheads. This section for the tiny tots of radio bids fair to become very popular, and I am looking to other readers to emulate the example set them, and render me all the assistance in their power to make this educational course the thorough-going success which it deserves to become. This week we deal further with the aerial mast.

The function of the aerial mast may be summed up in the equation

$$N = \sqrt{\frac{(x-P)(xyz)}{(a+b+c)}} + \left(\frac{\sqrt{V-nbg}}{Oh Y'eah?}\right),$$

where N is the silly mutt trying to hold the pole up straight and the rest is bad language.

$$\text{Then } W = \sqrt{\frac{(x-P)(xyz)}{(a+b+c)}} + N = \sqrt{\frac{(x-P)(xyz)}{(a+b+c)}} + \left(\frac{\sqrt{V-nbg}}{Oh Y'eah?}\right),$$

where W is his missus falsettoing as she undoes the aerial wire, and gets it all muddled up and kinked. But as the co-efficient of N, Fig. 2 (and what a figure!) is capable of handling large outputs, the damping effect of N is largely counteracted by the reaction feedback which she lets him have good and



Fig. 2.—and what a figure!

proper, so that with the square root from W, $N = .0000000001$. It can therefore be seen from the above that the matter is a simple one which any reader can work out for himself to his own satisfaction.

If any reader desires further elucidation of the above points I shall be happy to put him in touch with the criminal who supplied the lesson, but I can accept no personal responsibility, and in any case I am feeling far from my usual self this week—not at all an unpleasant feeling.