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TELEVISION

BIG DEVELOPMENTS

See this issue

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TELEVISION

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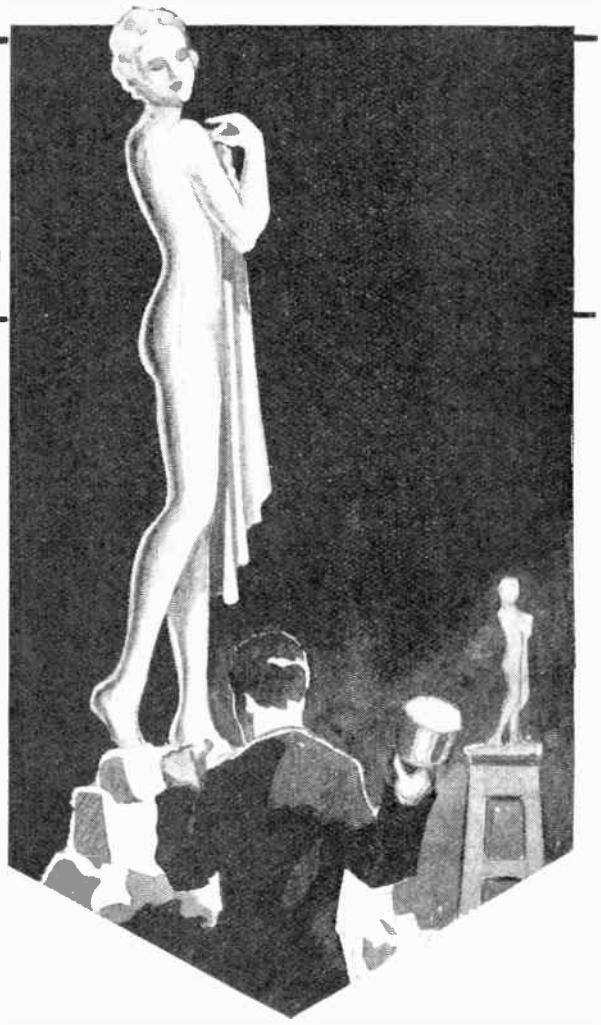

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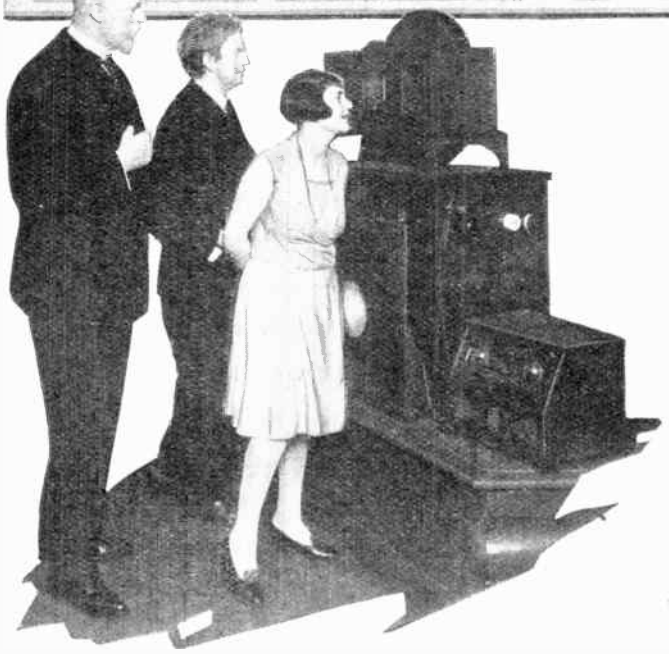

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VOL. III] FEBRUARY 1931 [No. 36

THIS MONTH'S CAUSERIE

NO one will quarrel with the announcement on the front page of this issue. The two words " Big Developments " aptly sum up the events of the past month.

* * * * *

There *have* been big developments. In the first place, there was the demonstration to the Press at the Baird Laboratories of Zone television by which full size living images were shown. An interesting personality who visited the studio to take part in the demonstrations was Mr. Strudwick, the Surrey and England professional cricketer, who was first seen batting, and later in his more usual position, behind the stumps. This, mark you, was television of actual living persons.

* * * * *

Another important development was demonstrated at the same time—the Baird Television Arc. This new modulated light source consisted of modulating the arc itself, current from a television signal being applied directly to the arc without the use of the Kerr cell. Light from this arc was focused by means of a condenser upon an aperture in a diaphragm, an image of the aperture being made to traverse a screen by means of a Weiller mirror drum with thirty mirrors. The details and definition were excellent, and the image reproduced was of intense brilliancy. A more detailed description of this new light source will be found elsewhere in this issue. Curiously, enough, a large section of the Press overlooked this important development, possibly because it was shown at the same time as the Zone television demonstration.

* * * * *

Hitherto, Mr. Baird has been alone among British television inventors to show the results of his experiments to the public, but last month the well-known Gramophone Company of Hayes excited public interest by announcing that it was showing a system of tele-cinema at the Physical and Optical Societies' Exhibition at the Imperial College of Science. What was shown was of tremendous interest, but how far this is an original system and comes under the heading of " Big Developments " remains to be seen, since the Baird Company has issued a writ against the Gramophone Company alleging an infringement of one of their patents. There, for the moment, this matter must rest.

* * * * *

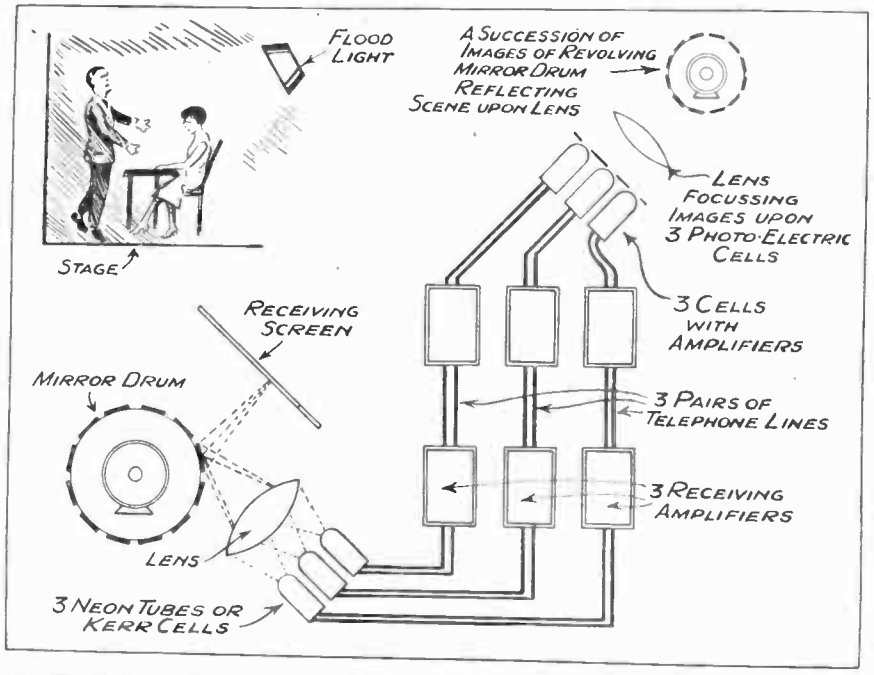
From the general public standpoint, the most interesting development of the month is the fact, obvious to all who are watching the situation, that the relations between the Baird Company and the B.B.C. have definitely entered on a new phase of cordiality. The promise held out by the B.B.C. of closer technical co-operation, is, we understand, being fulfilled both in the spirit and in the letter, and since it is by means of broadcasting that the interest of the public can be maintained and extended, this is a development which is all to the good.

ZONE TELEVISION

Development of Great Importance to Theatres & Cinemas

Scenes depicting Strudwick at the wicket, two men boxing, and a tea party, were shown when Zone Television was demonstrated to the Press at the Baird laboratories recently.

THE chief difficulty in transmitting large images by television is finding sufficient space in the ether. It is for this reason that the images sent out by the Baird Company through the B.B.C. are limited to restricted scenes. Where telephone lines are available, this restriction can be overcome by using several pairs of lines, and the Baird Company have developed an apparatus operating on this zone principle. It is intended to develop this apparatus for use in theatres and cinemas, as apart from home television. For, where places of public entertainment are concerned, there is no objection to using telephone wires between the central studio and the theatres.



Pictorially representing the three-zone television scheme demonstrated by the Baird Co.

In this latest apparatus the scene to be transmitted is not scanned by a rapidly moving spot of light, but is illuminated by ordinary flood-lighting, such as is used in theatres—or ordinary daylight is equally suitable. Full-sized scenes can be transmitted, and there is no limit to the amount of detail, so that there is nothing to prevent a development of this system showing views equal in size and detail to the cinematograph. It is entirely a matter of time and money; and, with the present rapid progress, the ensuing year will assuredly see great advances made.

The present apparatus, as demonstrated to the Press, showed projected on a small glass screen images of the full-length figures of as many as eight persons. These pictures were made up of three sections, transmitted side by side. The transmitter consisted of a large mirror drum with thirty mirrors which, revolving rapidly, caused a succession of images to be moved over three different apertures admitting light to three photo-electric cells. Each of these cells transmitted one-third of the total picture, the picture being split up into three adjacent zones. At the receiving station the light from three neon tubes is controlled by the current from the corresponding cells at the transmitter, and the spots of light from these tubes are caused to traverse the ground glass screen, building up an image of the scene in front of the transmitter.

There is no limit to the number of zones that can be used. The bigger the picture, the greater the number of zones and, of course, the greater the complication and expense. Complication and expense are, however, not serious matters where a public service, such as a theatre, is concerned, and it is for this purpose that zone television is primarily adaptable.

The system was described in one of Mr. Baird's patents taken out as far back as 1925, but has only recently been developed as it is unsuitable for wireless broadcasting, several channels being required. The success of the large screen demonstrations given last year by the Baird Company in London and on the Continent has encouraged the Company to extensive

development work in enlarged screens suitable for use in cinemas and theatres as distinct from television in the home.

The apparatus demonstrated has this noteworthy feature. An ordinary floodlight is used in place of the moving spot-light hitherto employed, and this has the great advantage that the apparatus can be used with ordinary daylight, so that daylight scenes come within its scope.

The next step in the development will be the transmission of an image on to a full-sized screen, and in this connection, disclosure was made for the first time early in January of a very notable advance. Hitherto the most brilliant light sources have been the neon tube and the Kerr cell. The neon tube is, of course, comparatively lacking in brilliance, while the Kerr cell, which is a light valve placed in front of an arc lamp, only allows a very small proportion of the effective light from the arc lamp to be operative. In the Baird laboratories success has now been achieved in modulating the light of the arc itself, so that the light from the arc lamp can be made to follow the variations of the electrical current directly, and this stupendous light can be focused direct on to the screen. This makes it possible to obtain pictures of a brilliancy enormously superior to anything hitherto achieved.

Herbert Strudwick, the Surrey and England professional cricketer, in action at the transmitting end in the three-zone demonstration.

The Press comments on the demonstration of Zone television are worth reading. The cinema trade paper, *To-Day's Cinema*, referred to "an amazing new development in the Baird television process, which makes it possible to project pictures on to an ordinary, full-sized cinema screen; televise people and objects illuminated only by arc lighting or daylight instead of an intensive 'exploring beam'; show an unlimited amount of detail in the picture."

In a special editorial note, the Technical Editor wrote: "It is my firm belief that Baird has at last hit on the very method which will bring television into the cinemas. It is a bold statement, but I make it in all seriousness, and when I saw yesterday's demonstration, I could see, beyond the tiny screen shown to a visitor, a new revolution in our industry."

The *Daily Express* wrote: "Hitherto not more than one stationary figure has been flashed through space, but at yesterday's demonstration eight moving figures were seen on a screen. A group of people, in a room in the laboratory of the Baird Television Company in London saw the full-size figure of Strudwick, the England and Surrey cricketer, appear on a screen. He stood in front of wickets and made imaginary strokes with his bat, which the audience in another room could see quite clearly. Then eight figures appeared on the screen."

Illustrating how the image of Mr. Strudwick appeared on the screen of the experimental receiving apparatus.

The Physical and Optical Societies' Exhibition

AMONG the exhibits at the Annual Exhibition of the Physical and Optical Societies at the Imperial College of Science were some instructive indications of recent developments in wireless valves in a display arranged by the M.O. Valve Company, Ltd.

The Exhibition was confined to standard home products, so that a number of exceedingly interesting advances in technique in thermionic valves designed for special purposes were precluded from being shown. At the same time the wide range of receiving and transmitting valves bearing the Osram trade-mark, which were staged in separate sections, attested very eloquently to the marked improvements made in the design, construction, and performance of present-day valves compared with their prototypes of only two or three years ago.

Among the receiving valves figured examples of battery-operated screen-grid types (the S.625 was specially shown to indicate the pioneer work on valves of this type), and 4-volt A.C. mains valves designed specifically for four different stages in receiving sets (as a contrast the earliest types of the K.L.1 valves with indirectly heated cathodes were also included). The latest marketed types of Osram valves, viz., the H.2, L.P.2, and P.2, each of which incorporates a new form of filament and sets a new standard in 2-volt efficiency, were prominently featured.

A series of three pentode valves, and no less than eight different power valves, designed for 2-, 4-, and 6-volt receiving sets, were also exhibited, while among the rectifying types of valves, in addition to the well-known U.5, U.8, and U.10 series, was a new mercury vapour rectifier, the G.U.1, periodical demonstrations with which were given to prove the magnitude of the rectified current.

In the category of larger valves for transmission, rectification, etc., there were to be seen both bright emitters and dull emitters of very generous wattage powers, cooled-anode valves, and extra high-tension rectifiers. An explanatory exhibit of components and radiographs in respect to a cooled-anode valve which had had a long life possessed a good deal of interest apart from proving the efficiency and reliability of this type of valve both structurally and electrically.

Interesting Mullard Exhibits

Some extremely interesting apparatus and demonstrations were staged by the Mullard Wireless Service Company, Ltd.

One exhibit showed in a very neat manner a typical application of the photo-electric cell. The apparatus consists of a valve bridge in which the place of the galvanometer is taken by a sensitive relay. The grid of one of the valves forming the bridge is connected to the anode of a photo-electric cell, and the bridge is balanced by adjusting the anode circuit of this valve, while light is falling on the photo-electric cell. On the beam of light being interrupted the bridge is thrown out of balance and a small current flows through the relay which closes an auxiliary circuit through which a counting mechanism is operated. This apparatus was used for counting the number of visitors to the Mullard stand.

Another exhibit was designed to indicate ten years of progress in high-frequency amplification. At one end of the scale was shown a receiver employing three stages of resistance-coupled, high-frequency amplification, and at the other a modern single-stage, screened-grid amplifier with efficient tuned circuits, it being possible to compare the voltage amplification obtainable with the two arrangements.

A third working exhibit showed Mullard rectifying valves and a single-wave rectifier in operation. This took the form of a dissected high-tension supply unit, the power transformer, smoothing circuit, and so forth being well spaced out and the wiring clearly indicated. Voltmeters and milliammeters inserted in the circuit at appropriate points indicated the input and output voltages, smoothing current and rectified and smoothed output current.

Of particular interest to those using large power amplifiers is the apparatus designed to show the occurrence of harmful transient effects in such amplifiers and the methods of avoiding damage to valves and apparatus due to these transients. A low-frequency amplifier with two large power valves in parallel in the output stage was exhibited. In this amplifier all precautions for obviating high-frequency oscillation are omitted and the circuit can be made to fall into oscillation by applying a transient voltage to the input. The oscillation is indicated by a small lamp connected to an exploring coil consisting of a single turn of wire and shunted by a small variable condenser.

In view of the fact that a writ has been issued by the Baird Company against the Gramophone Company, Ltd., claiming that there has been an infringement of one of the Baird patents, comment on the H.M.V. demonstration must be omitted, the matter now being *sub judice*.

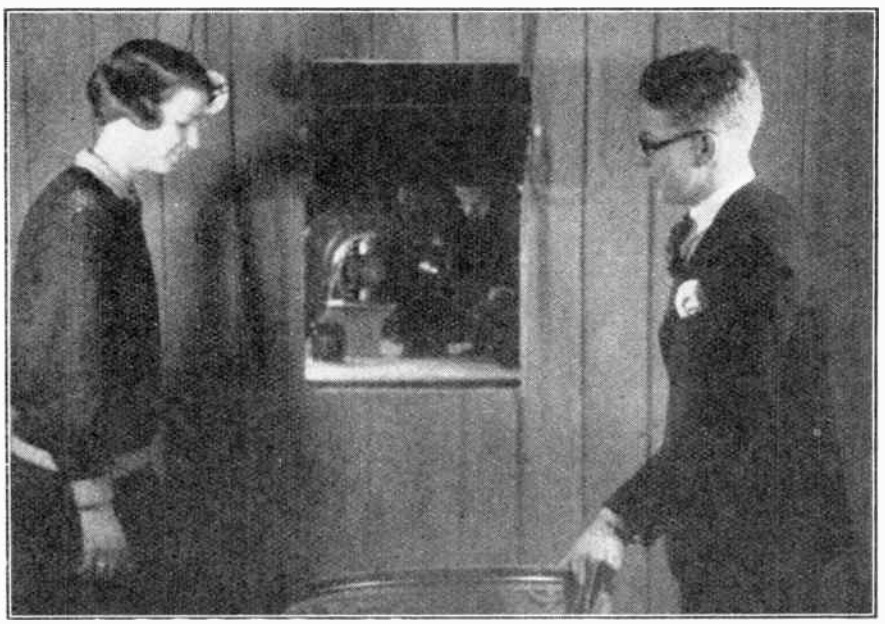
Television in 1930-1931

By Sydney A. Moseley

IT is not inappropriate at this juncture to review the year 1930 in relation to television, and then, perhaps, to cast our minds forward, to see what is likely to happen during the ensuing year.

The year 1930 opened with the announcement that the B.B.C. had arranged to give the Baird Company extended facilities for broadcasting. Particular interest was taken in the statement that there were to be two night broadcasts a week, for as I mentioned at that time this was a step in the right direction since most people were otherwise engaged at 11 o'clock in the morning when the daily transmissions took place.

This, be it understood, was the transmission of vision only, for we had not yet reached the stage when dual transmissions were on the ether, that is, vision and sound simultaneously. It is strange that nearly a year ago I approached this question, and to-day find myself approaching it again.



One of the artistes being shown to her seat on the occasion of the demonstrations of Baird Screen Television at Stockholm.

It is to be hoped that before very long a re-arrangement of the times will enable more "televiewers" (do you like this term, by the way?) to appreciate the wonders of television.

It was about this time that the Baird Television Co. announced their intention of going into production immediately, pending an arrangement with the big manufacturers. Of course, the snag has been that a good many people are not going to spend several pounds on a set which they are unable to use except twice a week—and then only if they are prepared to stay up till midnight. That is another question for 1931.

There were not wanting critics at that time—indeed, television has never been wanting for unfriendly criticism—who averred that the transmissions would fail in their purpose. Well, let us see! In the early part of 1930 the majority of people hardly knew what television was, even in this country, the home of television. Abroad there was the vaguest rumour as to what it was all about.

And now? Even those who were the most reluctant to offer encouragement, much less a tribute, will admit that the situation has changed completely. Television has not only entered the world's dictionary but has entered a good many homes in its commercial form.

Countries which were at first sceptical of this daily broadcast have actually come to London in order to take a hand in scientific history. Big radio corporations abroad are striving to emulate the British Broadcasting Corporation. Take France, for example. I suppose it is not too premature to state that a body of French radio, cinema, official and financial representatives came to this country, and after seeing what was actually being done, both from outside and inside the Baird laboratories, entered into an agreement for the broadcasting of the British invention, not only in France but in Belgium and Luxembourg and in the French and Belgian colonies. Arrangements have already been made for the broadcasting of television from the Radio Vitus Station for two hours daily.

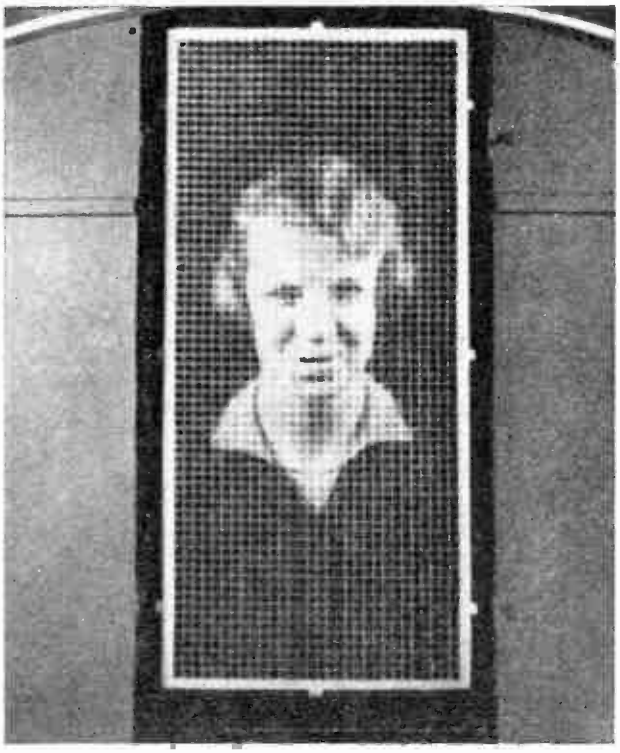
The next thing of note in 1930 was the inauguration of the dual transmissions. This was an important affair, and I will endeavour very briefly to recall this historic moment. The date was March 31st, the time 11 a.m., and there were assembled in the studio in Long Acre some of the most eminent public men and women who either took part or looked on at the first

dual transmissions of television to be put over the ether.

"Promptly at 11 a.m. the blank screen of the 'Televisor' showed signs of a signal coming along" (I quote from TELEVISION for May of last year) "and it was synchronised just as Mr. Moseley opened the proceedings."

Then Sir Ambrose Fleming gave a short address, after which Lord Ampthill, Chairman of the Baird Company, said a few words. After this Annie Croft and Gracie Fields entertained the great crowd of listeners in all parts of the country.

Another outstanding event which interested both the B.B.C. Productions Department and the Baird Company was the transmission of the first B.B.C.



This photograph gives an excellent impression of how the artiste appeared on the Baird lamp screen when it was shown at Stockholm.

play to be broadcast by television. This was on July 14th at the special hour of 3.30 p.m. from the Baird Studio at Long Acre. The play was "The Man with the Flower in His Mouth," by Pirandello, and was produced by Lance Sieveking on behalf of the B.B.C., in conjunction with myself. There were three characters, special scenery by C. R. W. Nevinson, and many ingenious devices thought out by the B.B.C. producer. The occasion was also marked by a risky experiment, the play being picked up on the roof of the premises on the big screen. A large influential company had assembled, and the Baird engineers themselves did not know how the thing would "pan" out. Fortunately it was successful. But between ourselves I may tell you I thought it was taking a chance at the time.

Developments were proceeding slowly but surely, and the next item of importance was the bursting, so to speak, on to the world of the big screen. There is no doubt that the fortnight's thrice-daily demonstrations of the big screen at the Coliseum, London, marked one more turning point in the history of television. Look up the press criticisms at that time and you will see how astonished the usually blasé critics were at the accomplishment.

Remember, this body of critics had never seen television before but had read and believed in the criticisms that propagandists abroad had spread throughout this country. While they admitted, as we all admit, that it had not reached perfection, they were unanimous in stating how wonderful it was.

The demonstration was followed by equally successful demonstrations in Berlin at the Scala Theatre, and Paris at the Theatre d'Olympia, and the Röda Kvarn cinema in Stockholm.

Well, there are developments going on at the moment about which I cannot speak, but I will say this finally—be prepared for big surprises.

* * *

After having written the above, the promised surprise occurred! The H.M.V. Co. announced that they were giving an exhibition of tele-cinema, and very kindly gave me the invitation I sought—to see what was happening in their research laboratories at Hayes. I duly went along.

On my return I wrote up a rather lengthy article for this magazine.

Having completed this job, came the news that the Baird Company had decided to issue a writ against the Gramophone Company, claiming infringement of patents. This, therefore, precludes me from going further into the matter, and my readers must excuse me.

* * *

Readers will be surprised when I say that until recently I was unable to use my "Televisor" in my own house. Need they be surprised, after all? Most of us have to be in the City by 11 o'clock, when the morning transmissions are on, and I certainly feel all-in by the time midnight comes.

Therefore I have had to content myself with looking-in each morning in the City, very often in the Baird laboratory itself.

The other day we had some young people to stay with us, and they insisted on working the thing themselves. Sure enough, just after 11 o'clock in the morning an excited telephone message reached me saying they had got a "splendid picture."

So enthusiastic were they that they stayed up till midnight the following Friday and got another good picture. All they did was to switch on the all-electric mains receiver and the synchronising came easily to them after five minutes' explanation.

I make a special point of handing this interesting experience on to readers, because even now it is surprising the number of people who imagine that it requires expert knowledge to manipulate the "Televisor."

An Output Controller

A Handy and Indispensable Unit for Television Readers

Designed and Described

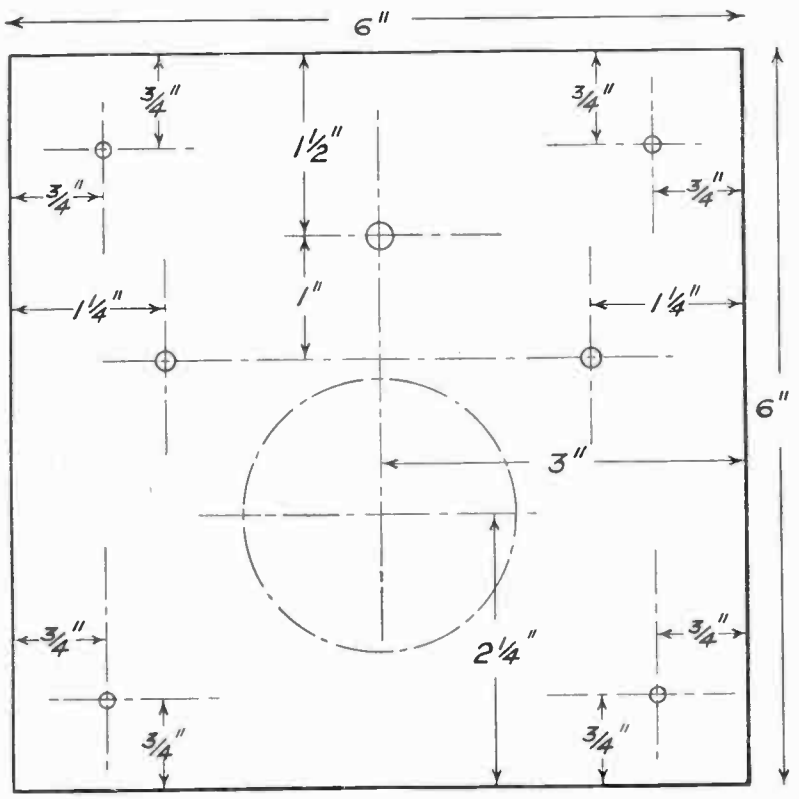
By *William J. Richardson*

IT has been stressed quite recently in these columns that as far as television reception (or ordinary wireless reception for that matter) is concerned it is most unwise to "work in the dark." Television is educating us to use our eyes more than ever, and it is in this connection that we turn to "meters" to aid us in the achievement of optimum results with the reception of television transmissions.

Use Meters Always

For the best images you are informed that the current passing through the neon should not exceed "so many" milliamps. Do not get into the slipshod habit of judging neon brightness by watching the "field density" when scanned by a perforated disc. Introduce a meter into the circuit and measure your variable quantities. The lucky possessor of a motor-car realises that on his dashboard he carries indicators and meters which tell him what is happening while he drives. Without some notion as to his oil pressure, miles per hour, accumulator charge and discharge current, etc., he would be worried as to whether the car was doing its work correctly and efficiently.

The same frame of mind should be encouraged when using the wireless set, either for aural or vision reception. Do *not* leave things to chance, and then you will stand an excellent opportunity of making your apparatus work correctly. The "Teletester" described by Mr. H. J. Barton Chapple in the November and December, 1930, issues of TELEVISION was designed for this purpose, but the output unit which I propose to give you this month will appeal to many when they realise that it is cheap and simple to make.



DRILLING DIAGRAM.

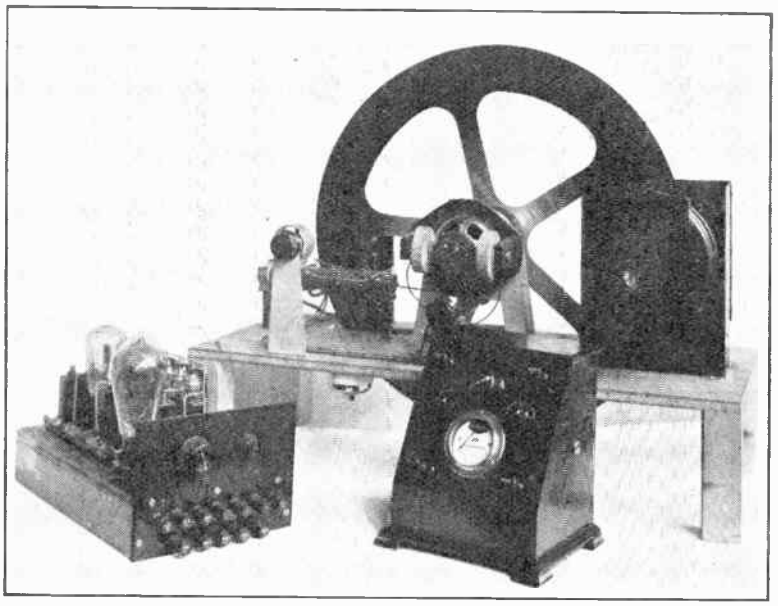
Fig. 1.—Here we have the dimensioned panel diagram to enable you to locate each hole centre.

Fidelity

One of the most vital links in the chain of contributory factors, which together ensure either de luxe reproduction or first-class television images, is the output stage. In the case of aural reception this, of course, is based on the assumption that coupled to the set is a loudspeaker boasting of such a fidelity of tone and clarity of speech that all sounds emanating from it become an

exact replica of that conveyed to the microphone at the transmitting studio. In a nutshell, the aim of everyone possessing a "sound" wireless receiver should be to ensure that every inflexion of the human voice, every subtle note of the orchestral music taking place at the studio, should be faithfully reborn at the listener's end.

The same arguments apply when considering the vision side, and any aids to achieve this end are sure to be appreciated by readers. The unit I have prepared is really quite straightforward; indeed its very simplicity, coupled with its utility, are its biggest recommendations for your attention.



The unit ready for connecting between the vision amplifier and "Televisor" made up from a Baird set of parts.

Suiting Different Contingencies

In Fig. 2 is shown the theoretical circuit. Since the unit in the main will be employed between the output circuit of the wireless receiver and the input to the vision or loud-speaking apparatus, not only are there input and output terminals, but a plug and jack has been incorporated also.

In the case of the latter it is necessary with this unit merely to remove the loud-speaker plug from the jack in the set, place it in the jack of the unit, and finally insert the unit's plug into the set. This will interpose automatically the milliammeter in the output circuit, and its variations can be noted and adjustments made according to the information which will be given in succeeding paragraphs. When terminals are in use on the set join the output of the set to the input of the unit, and the loud-speaker or vision apparatus to the output of the unit.

Although in those cases where the loud-speaker or vision apparatus are directly in the output plate circuit, it is regarded as conventional to join the long spring of the output jack to H.T.+ and the short spring to the valve plate, and correspondingly the ball of the plug to L.S.+ and the stem of the plug to L.S.—, there are cases where this scheme is not followed.

To allow for this a double pole double throw change-over switch has been included, so that a positive reading of the instrument is ensured, irrespective of the type of connections.

A variable resistance was incorporated, more especially to enable adjustments of neon current to be made, and thus produce the best images without having to touch any controls on the wireless receiver.

To meet those contingencies, where the resistance is not required, a switch is shunted across the resistance so that it may be short-circuited.

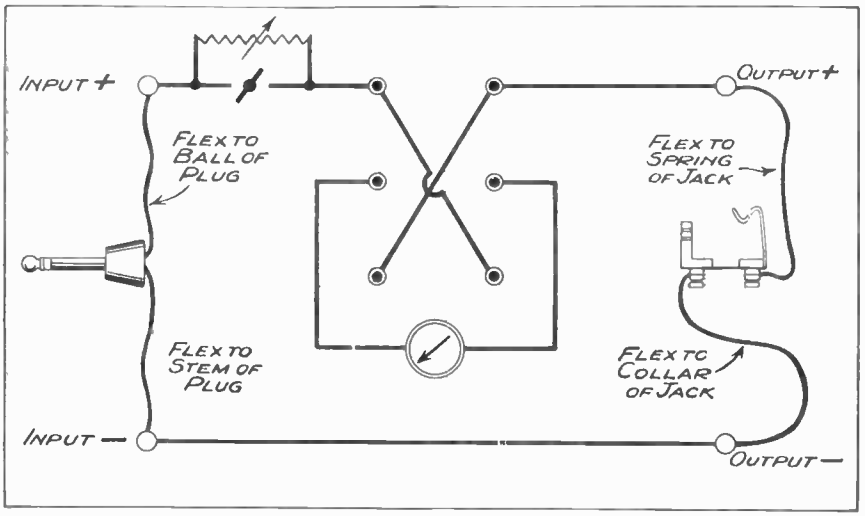


Fig. 2.—The theoretical diagram of the "output controller," showing how the switches, jack, etc., are arranged.

The Unit's Components

A list of the components required for making up the output controller is given below. Alternatives can be chosen in lieu of those specified, provided the usual precautions are taken to choose "quality" products, and ensure that they will fit in the space available.

One ebonite panel, 6″ by 6″ by ¼″ (Peto-Scott Co., Ltd.).
One sloping desk type oak cabinet to take above panel (Peto-Scott Co., Ltd.).
One 0 to 30 milliamp range moving coil milliammeter (Sifam Electrical Instrument Co., Ltd.).
One D.P.D.T. rotary switch (Benjamin Electric, Ltd.).
One S.P.D.T. rotary switch (Benjamin Electric, Ltd.).
Four insulating terminals marked output+, output—, input+, input— (Belling & Lee, Ltd.).
One single circuit jack with terminals (A. F. Bulgin and Co., Ltd.).
One embossed telephone plug (A. F. Bulgin and Co., Ltd.).
Four cabinet corner cushions and mountings (A. F. Bulgin and Co., Ltd.).
Small quantity of Lewcos glazite connecting wire.
Three feet of red and black flex.
Four wood screws.

Drilling the Panel

The construction of the unit should be quite a simple matter, even for the novice. In Fig. 1 we have shown the panel drilling diagram, all dimensions being indicated to enable you to mark out the hole centres with accuracy. Do not forget to mark out on the back of your panel, so as not to damage the polished face; but owing to complete symmetry in layout no difficulty will arise at this juncture.

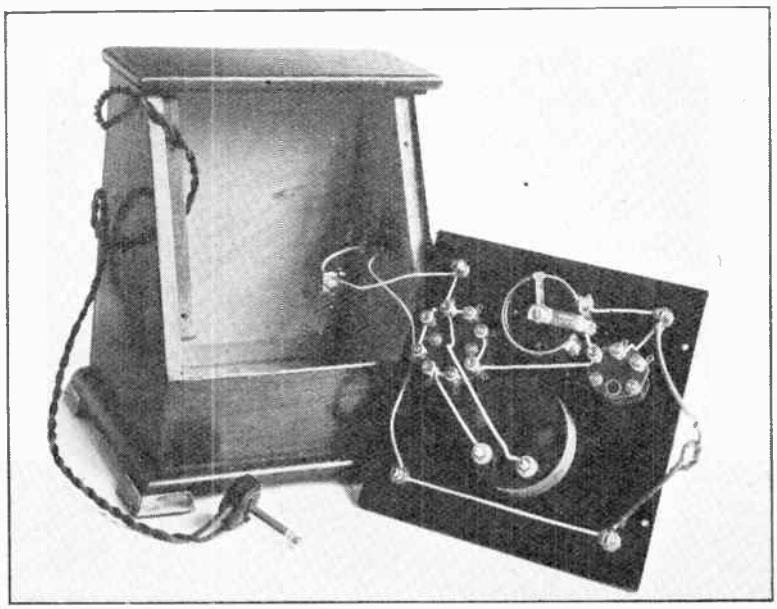
The sizes of the holes have not been given since this is governed by the components chosen. Just allow clearance holes for each item, and fix the four terminals, two switches, variable resistance, and meter in place. The accompanying photographs will aid you at this section of the work.

Next we come to the wiring. I have chosen every component with terminals so that the reader not handy with the soldering iron can make all his connections by looping the wire ends under terminal heads. Cut each wire to its correct length, and with the assistance of the wiring diagram, Fig 3, the points can be linked together exactly as illustrated.

Check the Wiring

Check every lead on the wiring diagram by cross-hatching with light pencil strokes the lines shown in Fig. 3, and then your unit will not fail to function owing to the omission of a necessary link.

You will notice that the small jack is mounted directly on to the right-hand side of the oak cabinet. Two flexible leads then join the output+ and output— terminals with the jack, as shown in the photographs and diagram. Also the red and black flexible lead which terminates in the plug has its free ends passed through the left-hand side of the cabinet, and is connected to the input+ and input— terminals. This completes the construction of the unit and the panel can be screwed into place in the cabinet. Once the corner cushions have been mounted all is in readiness to place the "output controller" into commission.



With the panel removed from the small cabinet we can see how the leads are joined to the jack.

Using the Unit

One of the photographs shows the unit arranged for connecting between the low-frequency amplifier I described in TELEVISION, March, 1930, and a "Televisor" made up from a kit of Baird parts. In those cases where the neon and synchronising coils (or neon alone) are connected directly in series with the output valve plate, Fig. 4 shows how the unit is interposed between the L.F. amplifier and vision apparatus. The same connections, of course, apply for a loud-speaker.

Provided the L.T. and H.T. sources are quite satisfactory (this is where a voltmeter of dual range is so valuable) under normal circumstances when signals are *not* being received, the needle of the meter will take up a steady reading, the actual milliamps flowing through the instrument being

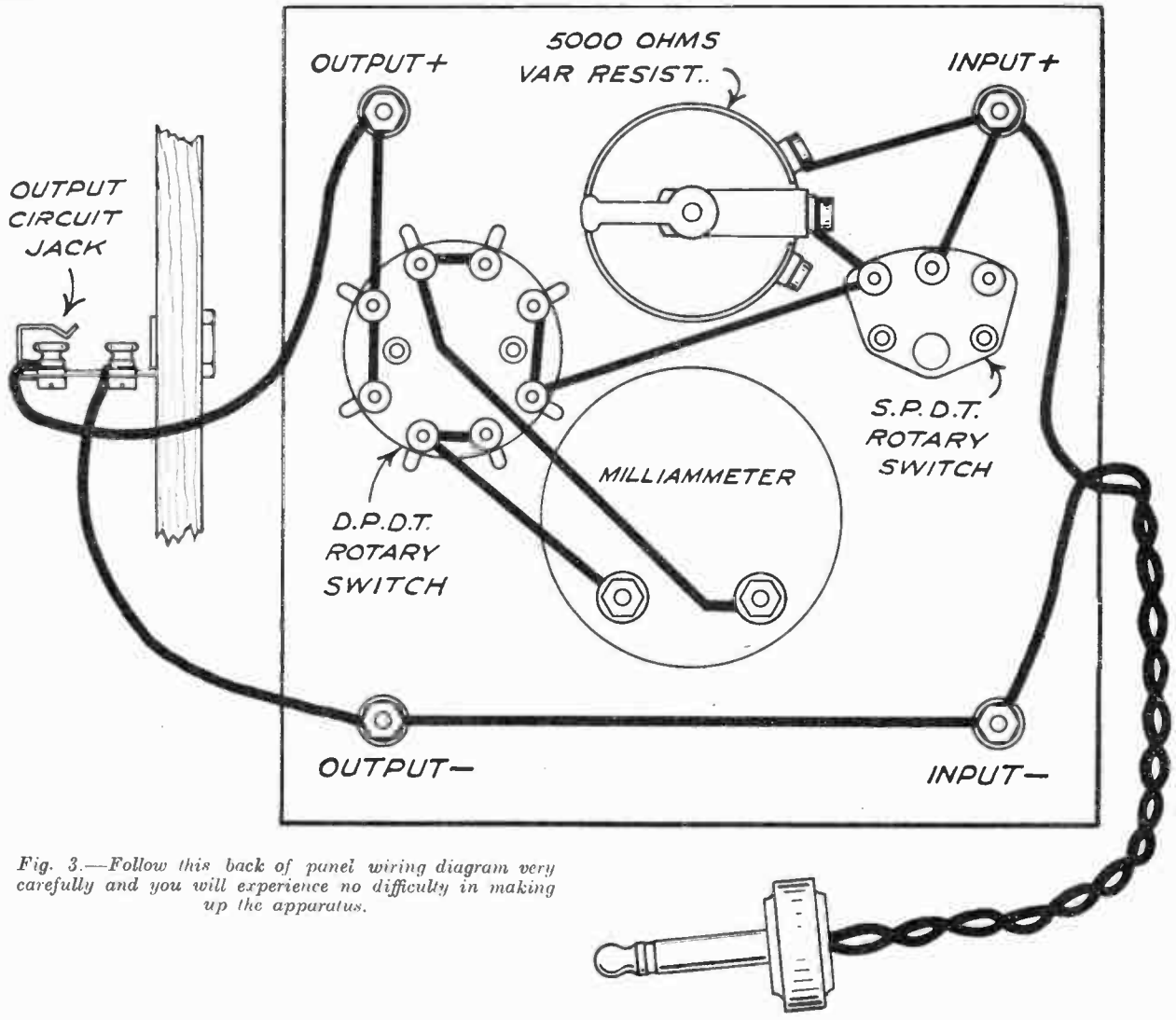


Fig. 3.—Follow this back of panel wiring diagram very carefully and you will experience no difficulty in making up the apparatus.

dependent upon the valve employed and its associated filament, H.T. and G.B. voltages. With the reception of signals, however, the plate current naturally varies, and if the variations are symmetrical about the mean value initially registered, then the needle will remain stationary, its inertia preventing it from following the rapid current alterations, and distortionless reception is taking place. Should there be any needle kicks, then you are departing from distortionless reception, and alterations and adjustments are called for.

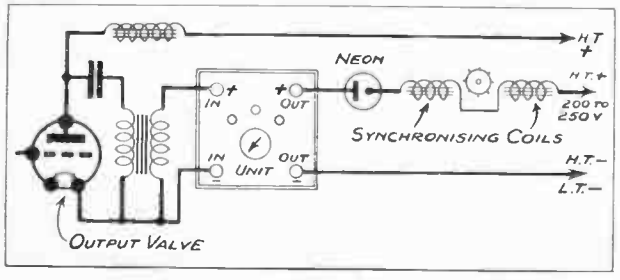


Fig. 4.—Linking the "output controller" to the vision apparatus when the output valve functions "directly."

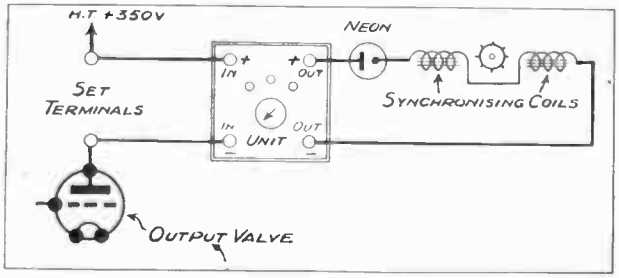


Fig. 5.—With a transformer output in the vision wireless receiver the unit is joined up in this manner.

Certain Remedies

If the needle movements are violent, and in any one particular direction, the cause is probably an overloading of the last valve, and two alternatives are open for curing the evil. Either cut down the

Neat and distinctive in appearance, Mr. William J. Richardson's unit should prove a most popular addition to the experimenter's equipment.

input to a lower value or replace the valve with one capable of handling the full grid voltage swing. Of course, there is a possibility that the valve has developed a deficiency, such as loss of emission, but even so a replacement will be necessary, and this falls within the second category.

Should the needle kick upwards violently and persistently, there is probably too much grid bias, and it is necessary either to reduce the value applied or, alternatively, increase the H.T. voltage. Provid-

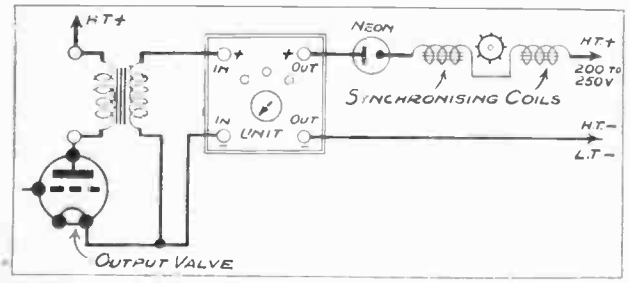


Fig. 6.—Showing how simple are the connections for a transformer and choke combination.

ing there is no overloading, either of these palliatives will cause the needle to cease kicking. On the other hand, if there is a tendency for the needle to kick downwards from its mean position, there is insufficient grid bias, and the cure is obvious. Make a point of adjusting both H.T. and G.B. values so that there is a minimum current flowing consistent with an absence of needle kick, as the drain on the H.T. source is thereby reduced.

Other Uses

In Fig. 5 we see the method adopted for interposing the unit when an output transformer is employed for passing on the vision signals. Here, of course, the milliammeter does not register the valve plate current, but the "polarising" steady neon current. This can be adjusted at will by means of the variable resistance, and in this way the neon may be worked at its lowest current value consistent with good image results.

The same argument applies for Fig. 6, where we have a combined output choke filter and transformer coupling.

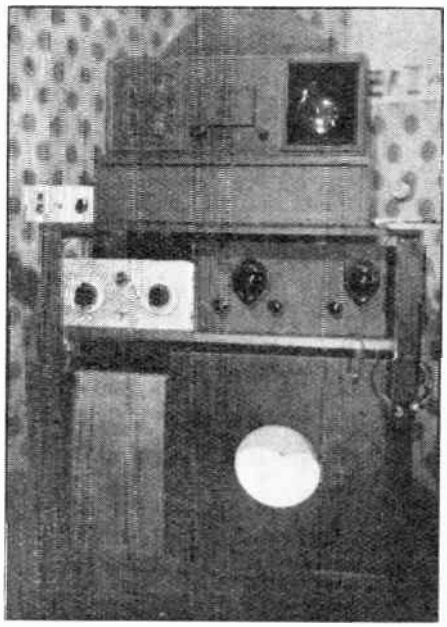
In addition, the milliamp consumption of individual valves can be ascertained, faults in components located by using the instrument as an indicator of breaks in windings, etc. For this purpose you must just bear in mind that connections to the milliammeter itself are provided by the output+ and input+ terminals, the resistance being short-circuited if accurate current readings are to be determined or, alternatively, left in circuit if the instrument is merely to be employed as a current flow indicator.

Other uses will no doubt occur to the reader, and he will find the "output controller" a most useful unit to have available when conducting experiments, both for television reception and in the reception of ordinary sound broadcasts.

Artistes you See and Hear in the Baird Television Transmissions

1. *Miss NORA SABINI, soprano, is a singer to whom television offers ample scope for the expression of her art.*
2. *Miss MARJORIE CHARD, the musical comedy artiste from "Little Tommy Tucker" at Daly's Theatre, who, apart from her ability as a singer, is a first-rate character comedienne.*
3. *Mr. DENNIS REDHEAD, entertainer, whose light comedy cameos are both clever and interesting from a television aspect.*
4. *Miss FREDERIQUE SPENCER, soprano, possesses a voice of charming quality. She has appeared in the musical operette "Bitter Sweet."*
5. *Miss BEATRICE ELBURN, soprano, besides being a keen worker at the Children's Theatre, London, is a busy concert singer.*
6. *Miss SEYMOUR WHINYATES, violinist, is a radio artiste who provides much enjoyment for television enthusiasts.*

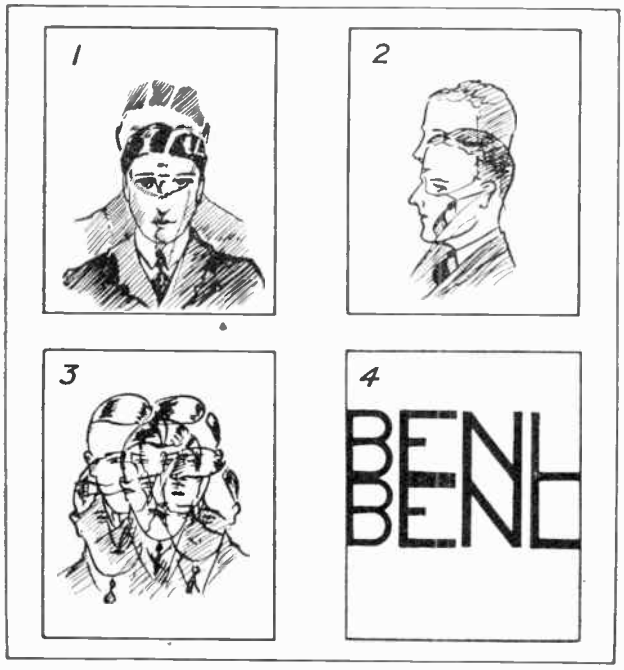
Our Recent Competition Winner Describes His Experiences



MR. GEORGE VERDUN, of 9 rue du Moulin, Antwerp, will no doubt be remembered as the winner of two neon lamps in our recent competition. The remarkable results which he obtained were described on page 442 of the January issue, and in response to an invitation from us, Mr. Verdun has sent along very complete details concerning his apparatus and reception. We print below the remarks exactly as received by us.

"As the winner of your competition of December, it is a pleasure to me to give you some commentaries on my reception.

"The reception of the Regional, which from July to August was very stable indeed, has become since



A very interesting diagram sent by Mr. Verdun, to illustrate the ghost image effects which he has noticed on his vision apparatus.

September rather uneven. My experience is that fading is sometimes very bad around 9 or 10 o'clock and becomes worse about midnight. Television reception is much better by daylight than at night. During the daytime fading, which is not perceptible by ear, is apparent to 'the sight' without being unpleasant however (except during the competition!!), but the image can be held for the whole duration of transmitting.

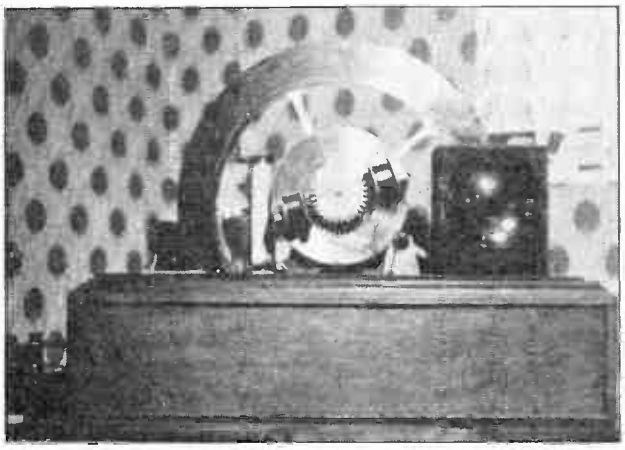
"*Receiving Set.*—My set, which is entirely home-made, consists of a S.G. followed by an anode bend detector, coupled to a three-stage amplifier—two-stage R.C. last transformer coupled—fed by accumulators of 240 volts. The valves employed are S 410, L 410, HL 410, L 410, PX 4. Results with two S.G., instead of one only, gave me an overcooked picture. I used a frosted neon (my flat plate neon arrived some days before the competition and could not be tried properly for this purpose). I tried power grid detection and this gave me the same results, but I changed it over to anode bend for reason of economy in H.T. consumption.

"I took great care to prevent the H.F. reaching the L.F. side of the receiver, and entirely shielded the L.F. amplifier in a metal box.

All the plates are decoupled and in the L.F. amplifier the plate of each valve is also carefully by-passed to earth by means of a small fixed condenser. The H.F. choke of the detector is shunted by two fixed condensers in series, the middle point being connected to earth. Grid bias is adjusted with a milliammeter. My aerial and lead-in consists of four wires, cage type, 40 feet long and 80 feet high. The sound is received on a separate set with a frame aerial (four valves), mains driven.

"*Vision Apparatus.*—I have entirely self-made and constructed my vision apparatus and synchronising device with the sole exception of the three lenses and the driving motor—which I have mounted on ball bearings—as described in your excellent magazine; and I cannot give further details without repeating what your different correspondents have already written on this subject.

"My disc has 24 square apertures of 0·68 mm. and six rectangular ones of 1 mm. I will tell you later how I obtain an exact and excellent punching of the apertures. The neon is in series with the plate of the 10-watt power valve.



Showing very clearly the vision apparatus employed at Antwerp for receiving the Baird transmissions.

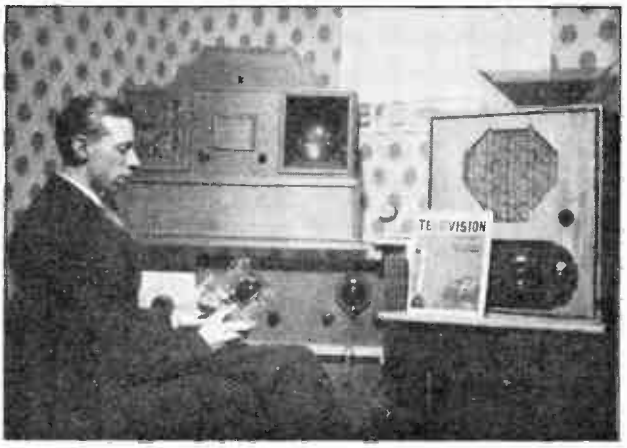
"*Experiments.*—My experiments and comparisons in television reception are always made with the same subject; the young 'vision-speaker' (? ? ?)—who, be it said in passing, has the knack of presenting himself before the aperture and enlivens the tedious period of announcing with some very natural gestures.

"*Echoes.*—I have often experienced echoes, but only at night; I have found three distinct varieties:—First, a *tendency* to form a double image with the blurring of the picture moving upward and never down or sideways. The blurring disappears after two or three seconds and the image becomes normal again. Secondly, a suddenly clear vision of two super-imposed images; duration 5–10–15 seconds, and a return to the normal picture. Thirdly, super-imposition of two pictures with a rotating movement which gives a spongy appearance to the face, over-cooked picture, notwithstanding using volume controls (pre-set, S.G. or L.F. or altogether). In this case loss of fine details; duration 5–10–15 seconds. I was lucky to have an echo during the transmission of the written programme and the lettering appeared twice (but *not entirely* twice).

"*For the Future.*—The little set which you can see on the left of the accompanying photographs is very easy and inexpensive to build. It can be adapted to practically any radio set as long as it has S.G. H.F. amplification. Connected to such a broadcasting receiver by simple switch or plug-in, it will increase the sensitivity of the set amazingly. On short waves this system brings in many trans-Atlantic stations on full L.S. strength. You can *choose* and *vary at will* the I.R., therefore ganged condensers are very well suited for this purpose. *It has the great advantage of not requiring a special and expensive set to receive short wavelengths*, and this will prove helpful when the television signal is sent out on short waves.

"I hope that soon transmission may be given on short waves and at more reasonable hours to be able to give demonstrations to the people—who are loath to wait till midnight to look only half an hour to the television enjoyment—and that your magazine may continue to enjoy great popularity and remain as interesting as it is at present."

GEORGE VERDUN.



Mr. George Verdun with the two Baird neons which he won in our recent competition.

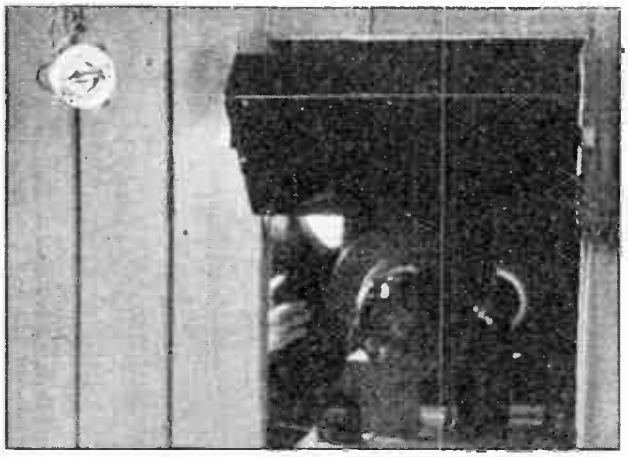
From My Notebook

By *H. J. Barton Chapple*
Wh.Sch., B.Sc.(Hons.), A.C.G.I.,
D.I.C., A.M.I.E.E.

Television in the Spirit!

RATHER an amusing thing was brought to light during the course of a conversation I had the other day with the head of the Patents Department of the Baird Company. He was discussing an invention for improvements in and relating to exploring devices for television apparatus. This has for its object to provide a construction of such a device which will permit of the production of brighter images by the use of more than one source of light for such production and will permit the reproduction of different portions of the same object simultaneously. When examining the complete specification the following paragraph was found :—

"It will be seen that with this arrangement each of the lamps is used in conjunction with only one of the spirals of holes and cannot produce any image by means of the *spirit* allocated to the other lamp."



Here we see the photo-electric cells and microphone as arranged at the transmitting end for the demonstrations of Baird Screen Television at Stockholm.

Obviously the word that was intended was *spiral*, and the misprint, if taken to heart, would lend emphasis to the ideas of those individuals who try to show a relationship between television and spiritualism!

German Television Transmissions

I am often asked for details concerning the television transmissions which are sent out from Germany. This country uses the standard 30-hole disc as employed by Baird, and works with horizontal scanning and a 4 by 3 ratio picture instead of the vertical scanning and 7 by 3 ratio picture used by Baird. The speed of the discs is identical, namely, 750 revolutions per minute, and it is possible by turning the vision apparatus on its side to watch these transmissions through a Baird "Televisor." Obviously with this arrangement, however, the images appear somewhat distorted owing to the fact that there is not the same amount of detail transmitted with the German disc as there is with the English. As far as the times of the transmissions are concerned the appended table may help readers.

Experimental television transmissions sponsored by the State Post Office take place from the Witzleben station in Berlin on a power of 1·7 kW., the frequency employed for this transmission being 716 kiloHertz, corresponding to a wavelength of 419 metres. The times of the transmissions are as follows :—

Monday .	8–9 a.m.	Noon–12.30 p.m.
Tuesday .	—	Noon–12.30 p.m.
Wednesday .	8–9 a.m.	Noon–12.30 p.m.
Thursday .	—	Noon–12.30 p.m.
Friday . .	8–9 a.m.	Noon–12.30 p.m.
Saturday .	Midnight–1 a.m.	—

In addition, the Königswusterhausen station has experimental television transmissions at a frequency of 181·8 kiloHertz, corresponding to a wavelength of 1,650 metres, the power being 35 kW. In this particular case the times are as follows :—

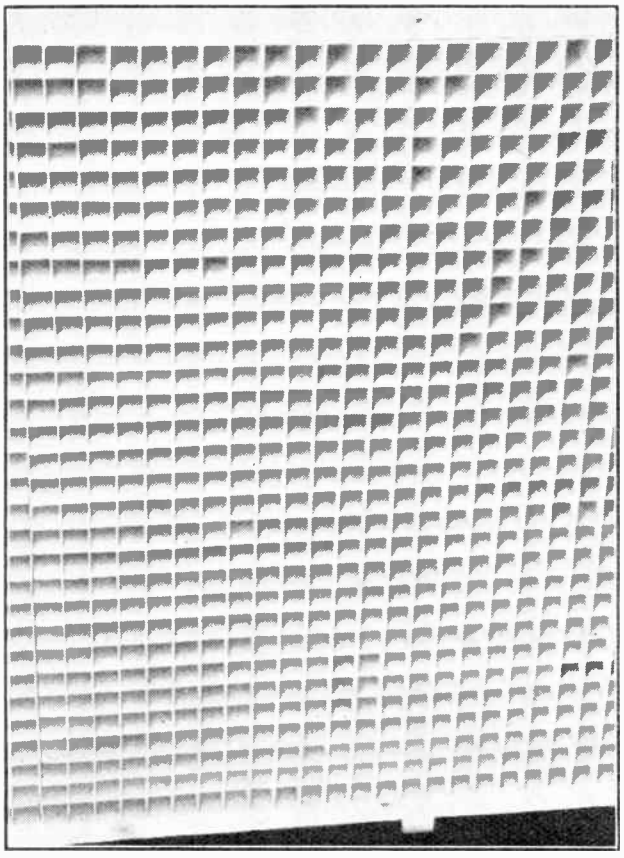
Thursday . . .	12.45–1.45 a.m.
Saturday . . .	8–9 a.m.

It should be noted that these times have been converted to Greenwich mean time.

How old is Television?

I wonder if readers can recall the remarkable feat accomplished a short time ago when some black ink smeared on a card was viewed from a distance of 20,000 miles through the medium of television. I

had it recalled to mind by reading an article in which this was hailed as a celebration of the eighty-seventh birthday of television. This seemed very remarkable, and on looking further into the matter I discovered that the first man to achieve television was given as Bain in the year 1843! This scientist sent designs by telegraph, using at the transmitting end a cylinder covered with tinfoil on which the lines were drawn in insulating ink. A contact pin was then made to travel spirally over the revolving cylinder, and contact made and broken as the insulating lines passed under this contact pin. At the receiving end, through the agency of an electro-chemical action, a similar synchronised cylinder reproduced the designs directly.



It has been mentioned on several occasions that the Baird lamp screen was made up in the form of a honeycomb. This illustration shows the framework used.

This was a remarkable achievement, but without in any way detracting from this early work of Bain, surely the process should more properly be regarded as the forerunner of tele-photo or facsimile transmissions? The *real* interpretation of television is the reproduction of sight at a distance, and by its aid we see people or events at the instant they take place.

The writer of the original article had undoubtedly fallen a victim to mixed definitions, and readers of this journal need hardly be reminded that true television was not accomplished until January, 1926, when Mr. Baird gave his now world-famous demonstration to members of the Royal Institution.

Television and Sidebands

Protagonists of the sideband and anti-sideband theory of wireless transmission continue to cross swords with one another, and there have been several letters in the correspondence columns of this journal dealing with the matter. Naturally the science of television has been drawn into the argument, for it is claimed that with the present 9 kilocycle separation allocated to sound broadcasting the amount of detail in the images secured from the vision transmissions within this figure is necessarily restricted.

Supporters of the sideband theory have both practically and theoretically demonstrated the existence of sidebands in many ways. Resonance curves of a selective receiver have been taken with an unmodulated, and then with a modulated, valve oscillator, and the resonance humps in the latter case exist at the frequencies theory predicted. Another point of view put forward is that a mathematical alternative invariably corresponds with some physical reality, therefore a sinuous wave of fluctuating amplitude may be rightly and exactly represented as if it were a band of neighbouring frequencies. Then, when making especial mention of television, it has been pointed out that the real issue does not lie in the change of current amplitude brought about by the varying reflected light picked up by the photo-electric cells, but by what rate of change of amplitude is admissible. The whole question is a very intriguing one, and no doubt in the near future will be thrashed out to a successful conclusion. In the meantime both sides stick manfully to their guns and work is being continued to prove and disprove the existence of sidebands.

Colour Television Proposals

The application of the needs of one industry to the requirements of another crops up frequently, and as a case in point mention may be made of the work of W. H. Peck, a New York expert in colour analysis. As a result of his experiments he has produced what is termed a colour-craft process which it is stated may have an application in colour television.

Actually the process is based on the breaking up of the light or colour into the component colours by means of a prism. The resulting rainbow of light is then "passed across" a special, highly sensitive photo-electric cell. Now since each colour, no matter how faint, has a different effect on the cell, it causes a current variation in the cell circuit. This method, it is stated, has been applied successfully to colour films, but up to the present anything in the nature of a practical colour television transmitter has not been described. For the receiving end, however, certain tentative proposals have been put forward.

It is well known that one of the difficulties in a vision receiver arises from the relatively small amount of light which is available. One light spot after another follow each other in order, either horizontally or vertically, until the image is built up finally in a fraction of a second. While the onlooker in any one instant should see only a faint dot of light, owing to the phenomenon of visual persistence and the rapidity

of the process, a complete image is conveyed to the mind. The suggestion is to rectify this "fleeting impression" by throwing the point of light on to a special plate (magnetic) so that it will stay there in magnetic form until it has covered the entire plate and impressed a complete image. It is proposed to carry this out in the space of one-sixteenth of a second, and the onlooker will then have a complete image shown to him sixteen times in one second.

It is claimed that if this idea is at all practicable it will result in a greater concentration of light at one time, thus giving a stronger image. The scheme in theory sounds very intriguing, but would appear to be tremendously complex.

Using the Mains for L.T.

In many quarters it is felt that in the ideal radio receiver all supplies of electricity both for high tension and low tension should be derived from the electric light mains. The question of eliminating the dry or wet H.T. battery was tackled some time ago, but the elimination of L.T. accumulators proved a more difficult problem. So far there has been no wholly satisfactory alternative for the accumulator for use in districts where the electric light supply is D.C., but with A.C. systems the use of accumulators can, of course, be done away with. Perhaps the most satisfactory types of A.C. mains valves are those known as indirectly heated valves. In these, instead of obtaining the electron emission from an activated filament, the heat is generated in a filament operating on A.C., and is transferred by radiation to an independent and highly activated cathode from which electrons are emitted. In this way risk of hum due to the use of A.C. is reduced to an almost negligible quantity.

In addition to the convenience resulting from the elimination of L.T. accumulators, the indirectly heated valves possess a further advantage in that their characteristics are distinctly better than those of the corresponding battery-heated valves. The improved characteristics arise from the fact that the electron emitting cathode is of larger area, and it is possible to arrange the grid closer to the cathode than in an ordinary battery-heated valve.

Short Waves and Long Distances.

Those who were unable to obtain copies of the remarkable publication on short waves which was recently published by Philips will be interested to hear that the company has issued a new edition.

A free copy will be sent to any reader who writes to Philips Lamps Limited, 145, Charing Cross Road, London, W.C.2, and mentions TELEVISION.

A wealth of interesting information is contained in the publication and we can recommend the booklet to all television enthusiasts.

The Enthusiast Sees it Through

THERE has been a ready response to our invitation extended to readers to furnish us with details of their experiments in television. We appreciate the trouble that they have gone to in preparing diagrams, having photographs taken, etc., and are sure that their efforts will encourage others to go and do likewise. We can see that the New Year resolution suggested by us in last month's issue has been taken to heart, and our columns this month bear witness to the good work that is being done by the amateur both at home and abroad.

Salford in the Field of Vision

Mr. A. Walters, of 56, West Tower Street, Seedly, Salford, is one of our enthusiastic band of readers, and is happy to be able to report progress. Also, in our recent competition, he was able to recognise and describe certain of the articles shown at the transmitting studio. This is indicative of the progress made by Mr. Walters, and we hope that he will still further improve throughout the New Year. He writes as follows :—

"At last I am able to report good results from the Salford district, thanks to Mr. William J. Richardson's and Mr. Water's articles in TELEVISION. I have been experimenting for about twelve months, but have never been quite satisfied until the last fortnight. On looking-in at the transmission on the morning of December 8th, at 11 o'clock, my labours (and heart failure) were rewarded with a clear but faint picture. There is nothing to say about the artistes themselves, but the competition articles were very good. The first item I saw was the drawing of a heart pierced with an arrow. The next was a hand shaking a hammer, and the third was a pair of Western Electric pattern headphones. The others I could not see clearly.

"Tuesday morning I missed altogether, but on Wednesday morning looked in for the last quarter of an hour and saw the following: First, a square letter-rack with the letters arranged so—

EV
NOS

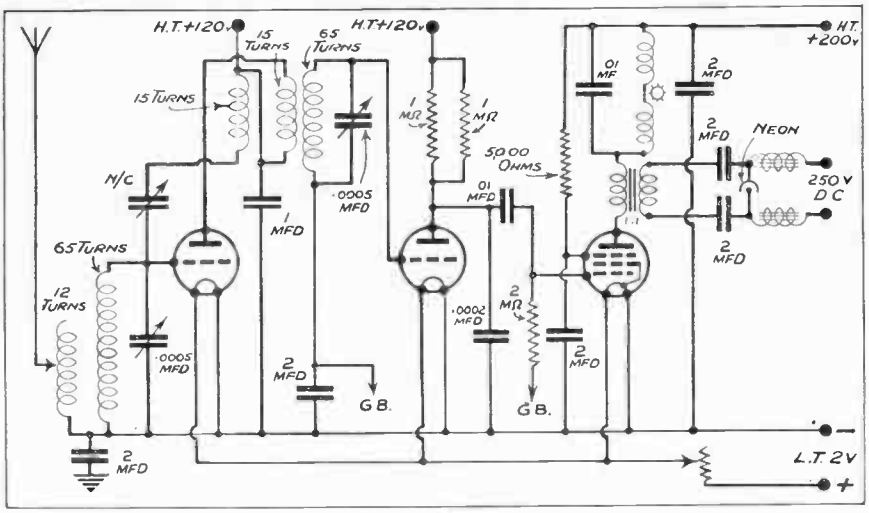
then a hand pushed the E towards the V. Secondly, a hand holding an umbrella; and thirdly, a hand holding five playing cards (one was an ace, and one was a five). I did not make a note of these articles at the time, so I cannot specify their order of appearance.

The tea party which formed part of the three-zone television demonstration in the Baird laboratories recently.

"I next looked-in on Friday night, December 12th, but this was spoilt by someone in the neighbourhood oscillating for the full half-hour. I managed, however, to see the lady giving a demonstration of toe-dancing.

"Well, I hope to advise greater improvements later on. In the meantime, wishing TELEVISION a prosperous New Year."

P.S.—" My set is a screened-grid valve, transformer coupled to the detector, R.C.C. to the first L.F., then R.C.C. to a P.625 valve. 200 volts only used throughout with choke coupling to the neon lamp (Osglim). I hope to see another amplifier by Mr. William J. Richardson, specially designed for the P.625 class of valve."



The circuit diagram furnished by Mr. Halstead in order to show how his results are achieved.

getting sufficient power from the pentode valve which feeds the neon, but further experiments on my part will decide this, or perhaps you will be good enough to offer suggestions with regard to this output."

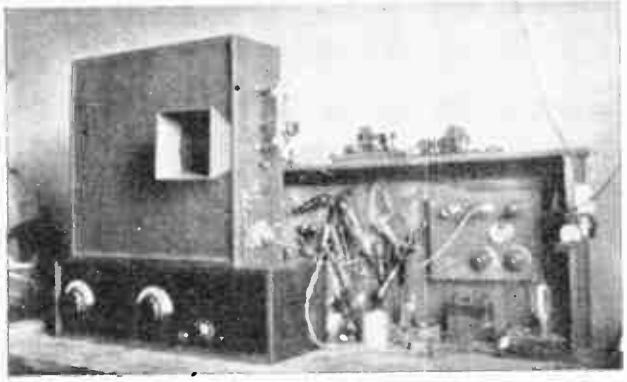
[We have made one or two suggestions to Mr. Halstead with regard to his output circuit, and shall look forward to further communications from him, indicating whether improvements have taken place.—Ed.]

A "Television" Prize Winner gets Better Images

Readers will no doubt recall that Mr. F. Halstead, of 23, Holland Road, Luton, Bedfordshire, was a successful competitor in one of our recent competitions. He was presented with a Baird disc, and the results he now obtains are decidedly better than those secured when he won the competition. We heartily congratulate Mr. Halstead and wish " more power to his arm " in his good work.

In sending us photographs and a diagram of his apparatus, he says :—

" As promised, I have pleasure in enclosing the photographs and a rough diagram of the circuit I am using for receiving the television signals. I may say that I am extremely pleased with the new



Mr. Halstead's vision apparatus and wireless receiver with which he won a prize of a Baird disc a short time ago.

disc which you kindly presented to me, the results being *decidedly* better with it. I do not think I am

Patience Rewarded

Mr. H. E. Weekes, of 25, Charteris Road, Kilburn, N.W. 6, is a reader who deserves to be complimented on his painstaking efforts connected with television. Undaunted at the poor results achieved with his initial apparatus, he stuck to the work and found out where his errors arose. Once these were rectified the images obtained were of a very high order. In sending us a long description of his work, Mr. Weekes describes, in detail, the various stages in the hope that it will be of assistance to other readers who are contemplating similar activities.

We congratulate Mr. Weekes most heartily, and are sure that readers will get inspiration by a perusal of his letter, extracts from which are reproduced below.

" I am forwarding you a brief account of my television experiments, hoping it will be of interest to you and readers of TELEVISION. I have been a keen radio experimenter and student since the early days of Writtle, and decided to commence television in 1928, and when the B.B.C. began to think of broadcasting television, I decided to construct apparatus and be one of the first to look-in. A ' Televisor ' was designed and constructed, the idea that any old thing would do being discarded from the first.

" As no mains current was available, a 6-volt motor was obtained, this being reconstructed and made to run at as even a speed as possible by eliminating all friction, reducing brush pressure, fitting good quality bearings, etc. A synchronising unit was constructed and arranged to rotate 45 degrees on an end plate, which was made and fitted to the end of the motor

yoke to serve as a housing for the ball-bearing as well.

"A 30-toothed mild steel wheel was turned, and the teeth worked out by drilling, hacksawing, and filing only. A brass centre was fitted to the wheel and also a brass centre fitted to a rocking plate to separate stray magnetic yields.

"Two coils with laminated iron cores were made and wound with 40 S.W.G. enamelled wire with condenser paper between each layer, about 8,000 turns on each coil, a covering of Empire tape being wound over. Flexible leads were connected to the windings and joined to an ebonite terminal panel screwed to the motor stand for convenience of checking polarity of magnets and experiments in methods of wiring same.

"Next the disc was constructed of 30 S.W.G. aluminium obtained from Messrs. Braby. Great care was taken with the construction of this unit, which was amply repaid by the absence of black and white lines between picture strips. Although this job of making an accurate disc should be simple to an electrical engineer well up in fine accurate work, I should advise the amateur to buy one.

"The disc was cut out with a cutting tool fitted to a trammel head, and this was also used to cut the lightening holes forming a 5-spoked disc. The viewing apertures were now marked out, starting with a 9·5 inch radius, the spacing being 12 degrees and holes ·028 inch square.

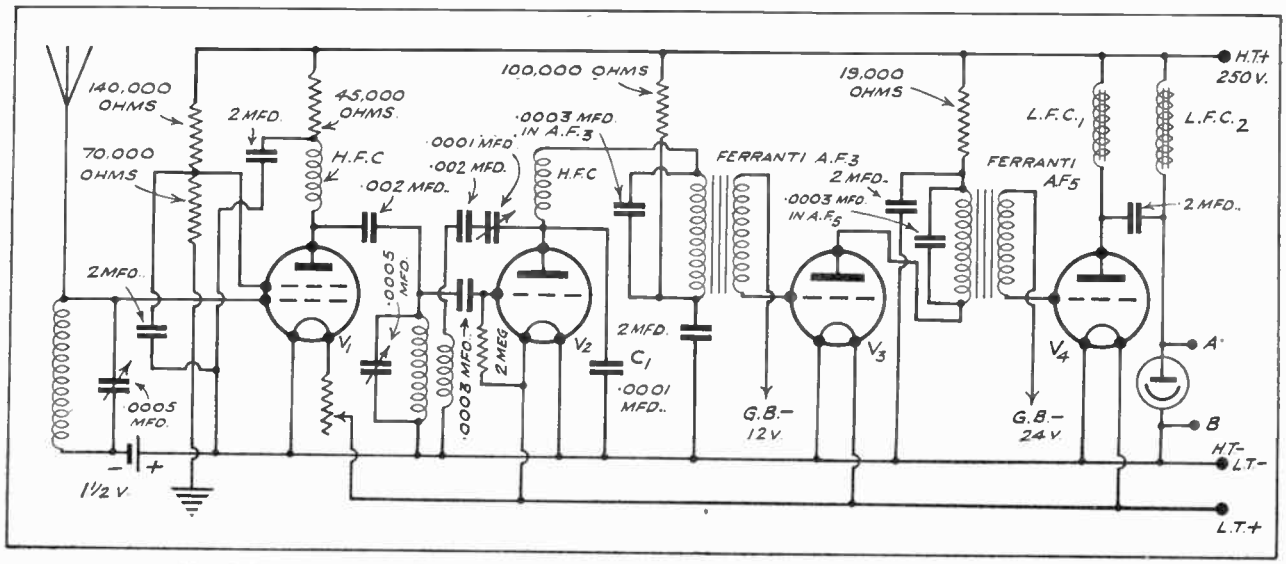
"Each hole was drilled with a fret drilling brace, and no drills broken. The radial or spiral spacing was executed by fixing a jig plate to an internal micrometer gauge while the square broaching was done by the same method.

"The viewing apparatus was constructed with provision for adjusting and focusing.

"The neon lamp, synchronising coils, and condenser were wired and brought to separate terminals fitted on an ebonite panel at the rear of the 'Televisor.' The reactance of the synchronising coils was found to be too great to pass the higher frequencies, so this was reduced by shunting with a ·25 mfd. condenser after trying, first of all, a ·05 mfd. and ·1 mfd. Another constructional feature of interest was the method of cabinet construction.

"The top of the cabinet was arranged to be removed, and the vertical panels slide out, allowing of easy access to the mechanism of the 'Televisor.' The interior of the 'Televisor' and rear of disc were painted dead black to avoid reflection. Attention was now given to the radio receiver. This being a powerful 5-valve set with an H.F. neutralised stage and grid detector, a special coil was constructed for the 261 wavelength to resonate with minimum capacitance.

"Results were not encouraging with the first few transmissions; details of black and orange images were observed; a letter B was then substituted for the beehive type. Parts of negative images were now obtained, but synchronising was poor due to 250 volts being used. Changing the wires on the transformer did not alter the image polarity, so this stage was changed to resistance capacity coupling and another power stage added in parallel with existing output stage, and 350 volts H.T. employed, also a plate type neon was obtained.



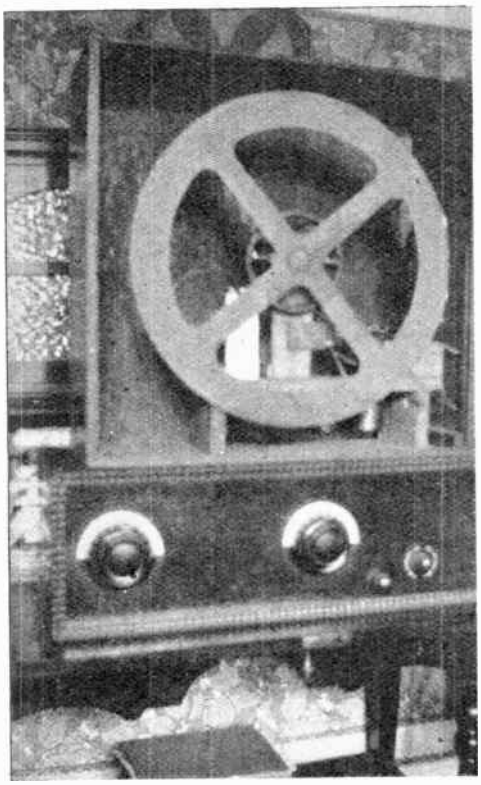
Mr. Orchard couples up his valves in this way for the reception of vision signals at Portsmouth.

"It was now decided to scrap this receiver and endeavour to construct a receiver that would receive, detect, and amplify over the whole low-frequency range of 50 to 10,000 cycles. A special auto-coupled aerial circuit was adopted to reduce resistance to a minimum, a fairly loose coupling to I.F. to obtain fair selectivity, but not cut side bands too much. One S.G. stage, anode-bend detector, 2 R.C. amplifiers, 2 super power valves in output stage. This set far surpassed the old one on test, both for audio and picture reception. The audio test was an organ recital, which I consider a good frequency test for a

receiver. Good results were obtained on the first television test, fine images being seen and detail being very good. The artistes' eyes, etc., showed very plainly, while the violin bow strings could be counted. The sketches came through very well, but the image floated slowly up or down. This could be held by assisting the synchronising coils with a vernier single wire rheostat, which was home-made. Finally, the trouble was overcome by using 450 volts H.T.

"Both parallel and series feeding the neon were tried, and the series method was by far the most successful and also held the image more steadily.

"Recently I have been using an M.L. Rotary Converter, and by efficiently screening the machine and constructing a suitable smoothing unit of chokes and condensers with a surplus current resistance,



The interior of Mr. Halstead's vision apparatus, the front view of which is given on page 493.

I found this a very successful source of H.T. current. This merits the attention of every television experimenter, as these machines can be obtained for a very high voltage and also it is rectified D.C.

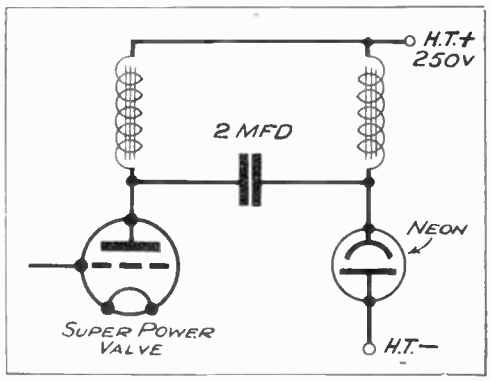
"I have given quite a few demonstrations and also interested quite a number of people in television. The disappointment of same is very real when the show is finished and they say the B.B.C. should give television a real chance and broadcast in the early evening.

"I have left the apparatus connected and the family have looked in on the mornings, getting good results."

Amateur Results at Portsmouth

In spite of the fact that his initial efforts only gave him crude images, one of our enthusiastic readers, Mr. D. F. Orchard, of 118, Devonshire Avenue, Portsmouth, Hants, refused to be beaten. He continued to experiment until the main source of his

Coupling the neon to the output valve is effected in this manner by Mr. Orchard.



trouble was found, and now this has been rectified he is, to use his own words, receiving splendid images. This is all the more creditable when it is realised that the bulk of Mr. Orchard's apparatus has been made up by himself at quite a small figure. This should serve as an encouragement to others to go and do likewise, and we have pleasure in quoting from Mr. Orchard's letter in the hope that his achievement will inspire other enthusiasts to follow in his footsteps. He says:—

"You will no doubt be pleased to hear the results I have obtained from the Baird Television transmissions, more especially as all my work has been carried out with quite modest apparatus. My early efforts I am afraid were not too encouraging as, although I had a very loud signal from the loud-speaker, I was unable to get a picture. After several efforts I obtained an extremely crude picture, but failed to improve on it for a long time. The trouble was at last found and a remarkable improvement effected by substituting a transformer of good make for the cheap one in the 1st L.F. stage, and I am now receiving splendid images.

"The neon lamp in use is a standard beehive lamp with the resistance taken out and the H.T. voltage is 250 volts at 80 milliamps. The set, of which I enclose a diagram of the output circuit, uses transformer-coupled L.F. stages, and I find transformer coupling to be quite satisfactory as long as high-

grade transformers only are used. The output valve is of quite modest size, it only requiring a maximum of 24 milliamps at 250 volts.

"The motor in use was made up and fitted with ball-bearings from the armature and field magnet of an old vacuum cleaner, and this will keep in almost perfect synchronism without synchronising gear being fitted. I think that any other enthusiast who has not made a 'Televisor' owing to the expense may disregard this difficulty, as I have made mine for a ridiculously small figure.

Mr. Piggott of Birkenhead with his experimental television equipment.

"The results obtained from this comparatively cheap apparatus at such a distance as Portsmouth is from Brookman's Park, speaks wonders for the Baird system, and I hope that the Baird Company will be granted further facilities as regards better transmission hours. I should suggest that suitable times would be on Saturday afternoon and late in the evening, when at least an hour's transmission would be of inestimable benefit to all enthusiasts.

"I should like to see more articles on the technical side of television in your already excellent magazine.

"Please accept my Best Wishes for TELEVISION in the New Year."

A Suggestion from Birkenhead

The fading that is experienced on the London Regional transmitter is deplored by our reader, Mr. J. W. Piggott, of 129, Gorsefield Road, Birkenhead. We can quite appreciate the difficulties that arise in this connection, but even so, Mr. Piggott is not in any way deterred and is able to receive the Baird transmissions on his apparatus. In sending us a photograph and diagram of his set, he lodges a hope that the new North Regional station will, before long, transmit vision signals. At the moment we cannot furnish him with any further details concerning the 50-metre transmitter of the Baird Company, although tests are at present taking place.

During the course of his remarks Mr. Piggott sends us the following :—

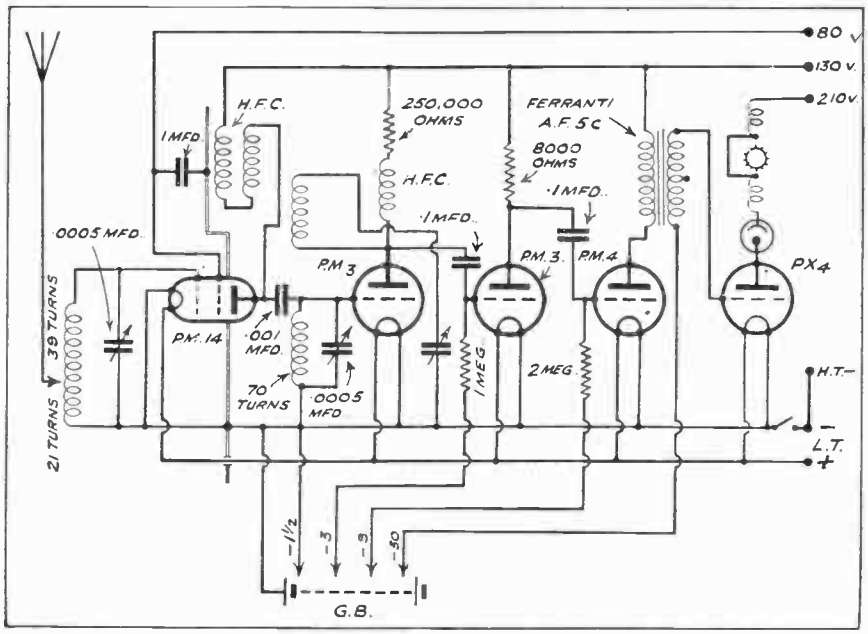
"Just a few lines to tell you of the progress of television in Birkenhead.

"My own apparatus consists of a S.G., det., two R.C., transformer, output valve — a PX4 working off 210 volts from D.C. mains. The vision apparatus is the usual fan motor, disc, Osglim (minus resistance) lenses, friction control, etc. Faces are good, although they nearly all possess side-whiskers, due, I think, to reaction.

"The letters may be read easily on occasions; but a doubtful magnet frequently fails to 'hold' the picture, and makes observation awkward.

"Sound is obtained by a one-valve set and 'phones, but the photograph shows a borrowed three-valver, which is worked off an indoor aerial, the vision set having the outdoor one. The 'Regional' fades badly at night, and this complicates matters. "Why cannot the Manchester station transmit vision? I am hoping to hear the new Northern station transmitting vision soon; incidentally, when will the 50 m. transmitter be on the air? Wishing your magazine every success.

P.S. — Have any of your readers ever used the note F sharp (above middle C) on the piano as a synchronising signal, after feeding it, through a microphone and the L.F. amplifiers to the neon lamp and 'Televisor'? The frequency is nearly 375, and is useful for tests."



The five-valve circuit used by Mr. Piggott for receiving the London Regional station at Birkenhead.

APPARATUS FOR SALE, EXCHANGE OR WANTED.—Advertise your needs in a small ad. in TELEVISION. Rates quoted on application.

NOTE THE CLOSING DATE.

Bound Volumes of "Television" to be Won.

Copies of "Television To-day and To-morrow" Given Away.

FOR the benefit of those readers who omitted to notice the announcement in our January issue concerning the obtaining of new subscribers, we are appending below the announcement which appeared on page 441. We would draw the attention of everyone to the closing date, February 10th, 1931, and urge all to make a point of seeing that their entries reach us in time.

That you yourself are interested in television and its future development is proved by the fact that you are a reader of this—the world's first television journal. Probably you are an enthusiast in the cause of television, in which case you will welcome an opportunity to arouse similar enthusiasm in some of your friends. This you can do by introducing to them the interesting and informative articles published month by month in the TELEVISION Magazine.

By so doing you will be helping to increase the ever-growing circle of subscribers to TELEVISION, as well as doing a good turn to your friends. At the same time you can also reap some little benefit yourself, because the proprietors of TELEVISION have decided to express their thanks in a tangible form to all who join in this effort to obtain new readers.

Bound volumes of TELEVISION, and autographed copies of "Television To-day and To-morrow," by Sydney A. Moseley and H. J. Barton Chapple, Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E., will be presented on the following conditions:—

1. To every reader who obtains by February 10th, 1931, six or more new subscribers to TELEVISION, a 7/6 copy of "Television To-day and To-morrow," signed by the authors.

2. To the three readers who obtain by February 10th, 1931, the greatest number of new subscribers, a bound copy of Volume 2 of TELEVISION.

3. Consolation prizes will be sent to every reader who obtains more than one and less than six new subscribers.

4. The names and addresses of the new subscribers, as well as the name and address of the reader by whom they are introduced, should be sent to:—

"New Readers,"
TELEVISION,
505, Cecil Chambers,
Strand, London, W.C.2.

Cheque or postal order to cover the amount of the annual subscription (7s. 6d.) should accompany each order.

Attention to the High Tension

PART II.

By *H. J. Barton Chapple*,
Wh. Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

AFTER introducing our subject of possible H.T. sources we dealt last month with the dry battery, and in a careful analysis summed up its advantages and disadvantages for television purposes. In this instalment of the series I propose to examine wet H.T. batteries and see if it is possible to reach any definite conclusions as to their practical application for television working.

Two Sections

There are two sections which come under the "wet" heading, namely, accumulators and the Sac Leclanche type. Dealing with accumulators first, we should at once be familiar with their action, for they are essentially miniature replicas of those large cells which we use as a source of low tension for feeding the filaments of battery operated wireless receivers.

Now the first essential is to give the battery a fair start by making sure that it receives a proper first charge. For convenience in packing and transport the batteries are supplied either uncharged or in a dry charged condition, and it is essential to see that each cell is filled with dilute sulphuric of the correct strength. This is always specified by the makers, and the prospective user of an H.T. accumulator for the first time is enjoined to read carefully the full instructions for "treating" the battery if the fullest service and benefit is to be desired.

In many cases it is necessary to place the battery in the hands of a service station for the first charge and subsequent recharges, so be sure and ascertain that the serviceman thoroughly understands his job. It is so easy to ruin an H.T. accumulator with a consequent expensive renewal that too much care cannot be exercised.

General Rules

To maintain an H.T. accumulator in a healthy condition the following general rules should be observed :—

(1) Give sufficient charge.
(2) Do not over-charge.
(3) Do not over-discharge.
(4) Do not leave the battery in a discharged condition.
(5) Keep the plates covered with acid.
(6) Keep the battery clean.

The fall in voltage of a battery during discharge is about 10 per cent., that is, from 2·0 volts to 1·8 volts. In many wireless sets it will be found that, in spite of the voltage of the H.T. battery having fallen to this extent of 10 per cent., the reception from the wireless set remains very satisfactory. There is therefore a risk of unknowingly continuing the discharge of the battery for a longer period than should be allowed, as the reception may not be noticed to be of poor quality until the voltage falls much below the safe limit of 10 per cent.

An Important Point

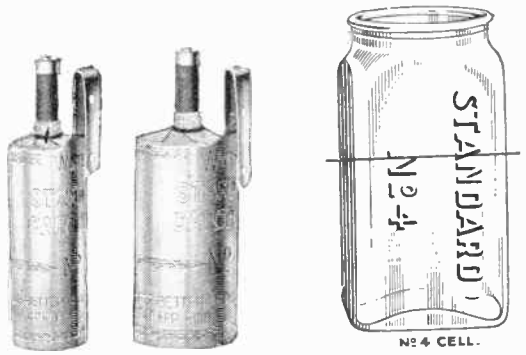
When testing to ascertain whether a battery is fully discharged, it is necessary to take readings of the individual cell voltages *whilst the battery is discharging at the normal rate*. Do not be misled into thinking the battery is not discharged by observing the "open circuit" voltage.

Although at the end of a period of three months a high-tension accumulator may not be fully discharged it is desirable to give a recharge at the end of this time, as this will keep the battery in good condition. In any case the battery should be recharged at least once in six months, even though the set be idle or sparingly used.

Where Defects Arise

We come now to the points to which attention must be paid by the battery user. First of all, over-charging. This may result either by charging at too high a rate or for too long a time. In either case it is injurious to the plates, causing excessive gassing and a dispersal of the active material. It is best always to charge at the normal rate, and in no case should the maker's specified maximum rate be exceeded.

Then, again, a battery should not be discharged beyond its rated capacity, as this will exhaust the plates and may lead to sulphating. As was emphasised earlier, in order to show the actual condition of the cells, take all cell voltage readings with the normal current passing.



The combined sac and zinc elements which are now supplied as one cartridge are indicated on the left.

A battery should not be allowed to stand in a discharged condition but should be recharged as soon as the discharge is complete. If this is not done there is a liability for the plates to become "sulphated," when special measures will be necessary for restoring the plates to good working order.

The plates should always be kept well covered with acid. In the course of working, the level of the acid will fall owing to a certain loss of water from the dilute acid by evaporation and gassing. This loss must be made good by the addition of *distilled water only*, and ordinary tap water must under no circumstances be used, as it contains impurities. It need hardly be added that for satisfactory working it is necessary to keep the battery clean. Any accumulated acid spray should be wiped off from the cell tops and the terminals wiped over with a little vaseline to prevent corrosion.

Suitable for Television

Having examined most of the outstanding points in connection with H.T. accumulators we can see that they are quite suitable as a source of high tension supply for television working. There is no necessity to reiterate the working figures given last month, and when we bear in mind that the capacity of the H.T. accumulators can be anything from 2,000 to 10,000 milliampere hours, according to the initial cost, it will be realised that they are fully capable of meeting the current demands of the vision apparatus. Most of the reputable accumulator makers, such as Exide, Oldham, National, Ediswan, Hart, etc., manufacture this class of product, and readers are advised to write to these firms for full prices and particulars.

Sac Leclanche Type

We must now focus our attention on the other form of "wet" H.T. battery, namely, the Sac Leclanche. It is often said that ordinary H.T. accumulators do not meet with approval with some users because of the individual's inability to undertake the required periodic charging in their own homes, and they are either too far away from a service station or object to the "listening or seeing" time that has to be lost while the battery is being charged. Added to this, in order to secure the best life from an H.T. accumulator, it needs to be handled with care and is liable to damage.

To serve the needs of this class we have the Standard Wet Battery. A common ground for prejudice against this form of high tension arose from the impression that it was messy and liable to be upset and be messy to assemble and recondition. The new type of cartridge marketed by the Standard Battery Co. overcomes this common belief in a very practical manner.

Special Cartridges

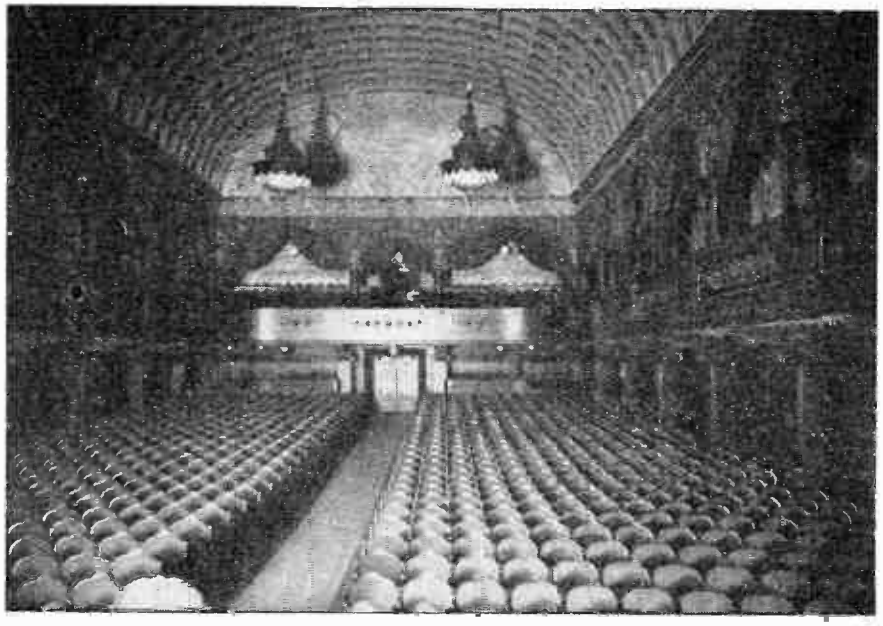
The cartridge, hitherto composed of two separate electrodes, the sac and the zinc, is now supplied as one complete component which has to be placed in the jar. A waxed cork then effectually prevents evaporation or spilling of the electrolyte or fluid. This greatly simplifies assembly, which may be undertaken by the user himself or alternatively the manufacturers will supply the battery already assembled. In this way it becomes as convenient and easy to use as any dry battery.

Furthermore, each cell is now connected to its adjacent cells simply by clipping the zinc element which is eyeletted on to the cap of the sac element of the next cartridge. Each zinc is also treated with

special paint to prevent the electrolyte eating into parts most liable to attack, such as the lug when this enters the fluid.

Large Capacity

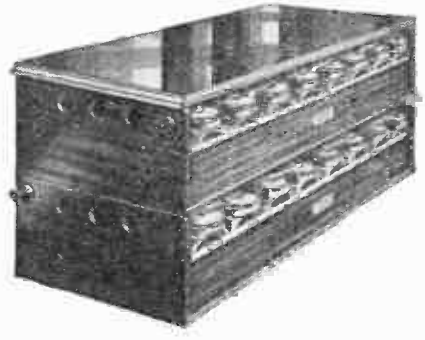
This new cartridge type of H.T. battery is supplied in two sizes, known as 3 and 4. The former has a 10,000 milliampere hour capacity and the latter a 20,000 milliampere hour capacity. These cells give 1·5 volts when installed, and eventually the cartridge requires replacing when the voltage has dropped to 0·7 volts per cell. It is thus seen that only the active parts need renewal and, in consequence, the upkeep costs are not a heavy item.



When the Baird lamp screen was shown in Stockholm the studio was arranged at the back of the large hall shown here so that the public could see for themselves how the transmissions took place.

Bearing in mind the rated capacities mentioned in the preceding paragraph, it will be realised that this type of H.T. source is very well suited for television purposes. It is stable in action, gives silent running, and is quite reliable. Naturally, the first cost is fairly high, but when reckoned on an annual basis the cost will be found quite economical. I have had personal experience with these batteries extending over a number of years and have found them in every way satisfactory, amply fulfilling the maker's claims.

We are now left with H.T. sources which call for the use of the mains to derive our power. This can take several forms. Either we can employ dry rectifiers or valve rectifiers with the associated smoothing components when alternating current is available or a form of rotary converter to change the A.C. to D.C. of sufficient output voltage and current. Then if we have D.C. of high or low voltage "M-L" machines are available to fulfil our needs, and it is to this apparatus that we shall direct our attention next month.



Depicting the tier arrangement of the cells in a Standard H.T. Battery.

There are so many people who have electric light mains in their homes that it is small wonder they seek to press this form of power into service. Many advantages accrue provided due care and attention is paid to the problems involved, and I hope to give actual constructional details of units which will meet the needs of television. These will include wiring diagrams and component lists.

Demonstration of the Baird System of Television at the "Daily Mail" Schoolboys' Exhibition—January, 1931

AMONG the innumerable outstanding and instructive exhibits at the *Daily Mail* Schoolboys' Exhibition, one of the most interesting to the majority of the visitors, most of whom were of the younger generation, was undoubtedly that staged by the Baird Television Company.

A very attractive stand had been erected on the ground floor, where demonstrations of television reception were given continuously each day. These demonstrations, which occupied only a portion of the stand, were augmented by a display of the products of the Baird Company, comprising not only complete "Televisor" Receivers and their component parts, but also the Wireless Receiver which has been marketed for use in conjunction with the "Televisor" Receiver, and has been specially designed for that purpose.

In addition to this a portion of the stand was allocated to working models of some of the original equipment with which Mr. J. L. Baird carried out his experiments in the early days of television. This display included a model of the first "Televisor" receiver, and which, by the way, is shortly to be placed in the South Kensington Museum, and also apparatus with which the most important principles of television were demonstrated. The interest displayed in these exhibits was very great, and the salesmen in charge had a very busy time answering innumerable questions and demonstrating the basic principles of television.

As far as the actual receiving booths were concerned, the queue of enthusiastic youngsters was formed shortly after 10 o'clock each morning and this queue, varying in length, but always continuous, was sustained until the close of the Exhibition at night. An average of approximately 2,500 people per day witnessed these transmissions.

As our readers are no doubt aware, the Lord Mayor, Sir Phené Neal, opened the Exhibition. One of the first exhibits he visited was the reception end of the Baird television demonstration, while on the closing day Sir Francis Goodenough "sat in" in the studio on the first floor and was duly transmitted to Lady Goodenough and a party of friends at the receiving end.

The interest of the younger generation was very clearly shown on the commercial model side of the exhibit; at times the attendants were entirely overwhelmed by a rush of schoolboys who not only wished to examine the Company's products, but who also plied them with technical questions on the subject of television generally, and there is no doubt that the youngsters have fully made up their minds that television is one of those things with which they wish to be conversant.

To any one who has an interest in this new science, nothing can be more satisfactory than the fact that youth has no time for the scepticism which is found in so many quarters, and that it fully appreciates the inevitable arrival of television as a factor in everyday life.

As the organisers of the Exhibition so truly pointed out, the youth of to-day is the ruler of our destinies to-morrow, and with such whole-hearted enthusiasm and such desire for information on this new science as was displayed at the Schoolboys' Exhibition, the ultimate success of the efforts of the pioneers of commercial television is assured. H. W. E.

Recent Developments in Photo-Electricity

By *H. Wolfson*, B.Sc., F.Telev.S.

WITHIN the last few months a number of highly interesting new cells have been invented, in which earlier practice has been entirely disregarded. These new cells are being improved upon rapidly, and their importance from a television point of view cannot be disregarded.

We will, first of all, turn our attention to what may be termed the "cuprous oxide dry type" of cell. Most of us are acquainted, I believe, with the copper oxide metal rectifiers, which are used in battery eliminators and charging equipments. It was discovered some years ago by Grondahl, of the Westinghouse Company, that the material used for rectifiers had certain light-sensitive properties, but the discovery was never investigated until recently.

Several workers, notably Lange and Ruben, have been responsible for bringing these devices into the prominence which they deserve. The dry cuprous oxide cell, sometimes called the "pyroxyd" cell (Fig. 1), contains as light-sensitive substance a copper plate which is covered with a prepared layer of cuprous oxide. This is the red oxide of copper, Cu_2O, which contains two atoms of copper to one of oxygen, and this may be prepared in a variety of ways, one of which will be indicated later on.

Fig. 1.—This is a cuprous oxide photo-cell (actual size).

Dry Cuprous Oxide Cell

The outer side of this photo-active layer is covered with a strip or gauze-like transparent covering of copper, which is transparent to light. The ideal arrangement would be a transparent sheet of copper, in intimate contact with the sensitive surface, but in actual practice it consists of a copper "gauze" which is electro-plated on to the sensitive surface. This thin copper covering is in intimate contact with the metal casing of the cell, and constitutes the positive electrode of the photo-cell. The inner copper plate which carries the cuprous oxide layer is connected electrically with a second insulated terminal, and this forms the negative electrode of the cell.

The normal internal resistance of the cell is extremely low, being of the order of 200–300 ohms. Actually the cell has two different resistances, one of which we may term the reverse resistance. This latter resistance is of the value 5–10 ohms. The resistance is easily determined by using a 2-volt battery and a milliammeter connected in series with the cell. The resistance is first measured with the positive terminal of the cell connected to the positive side of the battery, and then with the negative cell terminal to the positive battery terminal. Those readers who are familiar with the theory of the metal rectifier will remember that the value of forward resistance to reverse resistance in this case is of even higher ratio.

Cell Capacity

The capacity of the cell is about 150 cm. (i.e., $150/9 \times 10^5$ micro-farads) or about 165 micro-micro-farads. The cell can be used without any polarising voltage, and thus differs entirely from the accepted types of photo-cell or selenium cell. Different variations of the same type of cell have different outputs, and it is thought that by incorporating traces of other substances with the cuprous oxide, even greater outputs may be achieved. If light from a 30-candle power metal filament lamp is focused upon the cell by means of a condenser of 12 inches focal length, one obtains a photo-potential of some 4 or 5 millivolts, and the current from the cell is of the large order of 0·1 milliamps. One of these cells tested by the author gave a current of $1{\cdot}2 \times 10^{-5}$ amp. (0·012 milliamps), with 100 lumens illumination, and without the help of any polarising or other voltage.

Other independent measurements give the current as $0{\cdot}21 \times 10^{-8}$ amps. per lumen, for a cell having a resistance of 450 ohms. The cell loses its sensitivity on strong heating, as do ordinary cells, but unlike these, it regains its sensitivity on cooling. As will be seen from the curves in Fig. 2, the maximum spectral sensitivity is in the red end of the spectrum, and this

goes right into the infra-red, so that it is especially adapted for use with artificial electric light. The cell is free from an undesirable time lag, or inertia, which we are accustomed to with ordinary selenium cells. These cells are adapted to use in television transmitters, talking pictures, photo-telegraphy, etc.

The next general type heading will be termed "cuprous oxide, wet type," and this may be further subdivided, already, into three classes, all of which are the result of the researches of Samuel Ruben.

A Liquid Dielectric

The first sub-type is really a light-sensitive cell of the condenser type, which uses the change of resistance of an electronically conductive substance, usually crystalline, which is responsive to light rays, to effect current changes. The cell consists of the adjacent surfaces of co-operating electrodes, one of which at least has light-sensitive properties separated by a liquid dielectric, whereby a change of capacity between the electrodes occurs when the surface resistance of the electrode changes under the influence of light. This cell gives the maximum effect with a high frequency excitation.

One electrode of the cell consists of a prepared layer of cuprous oxide on copper, as before, and the coating should be non-porous, crystalline, and homogeneous. For the co-operating electrode one may use either the same material or selenium, molybdenum sulphide, etc., or both electrodes may consist of either of these two latter substances. Greatest success seems to have been achieved with the cuprous oxide electrodes, as will be seen from further developments of this cell which we shall consider shortly. The liquid must be of high specific inductive capacity, and glycerine, castor oil, and ethyl alcohol are all found to be suitable liquids.

Fig. 3 shows the disposition of the various parts. *E* and *E'* are the electrodes, *G* the glass container, *A* an alternating current generator, and *R* a resistance to regulate the potential applied to the grid of the valve, *V*. The electrodes are so placed as to provide minimum external reflection of the exciting light.

In operation, when an A.C. potential is applied to the cell and resistance circuit, there is a flow of current depending on the electro-static capacity and the value of the series resistance *R*, and that of the condenser cell. As light enters the space the surface resistance of the cuprous oxide decreases, and the current flow is increased. This current is amplified by the valve, and the current flowing through the device is modulated in accordance with the modulation of the impressed light rays.

Contact Resistance Variations

In the next sub-type the variations in the contact resistance and the specific resistance of a cuprous oxide layer integrally formed on a plate of copper, in response to variations in light intensity, are utilised to produce a corresponding change in the potential and current discharge of the device, means being available to prevent the reduction of the cuprous oxide layer by the electrolytic potential which will also be present.

The cell is formed by combining the cuprous oxide copper electrode with a co-operating electrode, which may be either electro-positive or electro-negative with regard to the oxide electrode. Examples of the first class are magnesium, zinc, cadmium, or aluminium, while carbon or selenium are members of the electro-negative class.

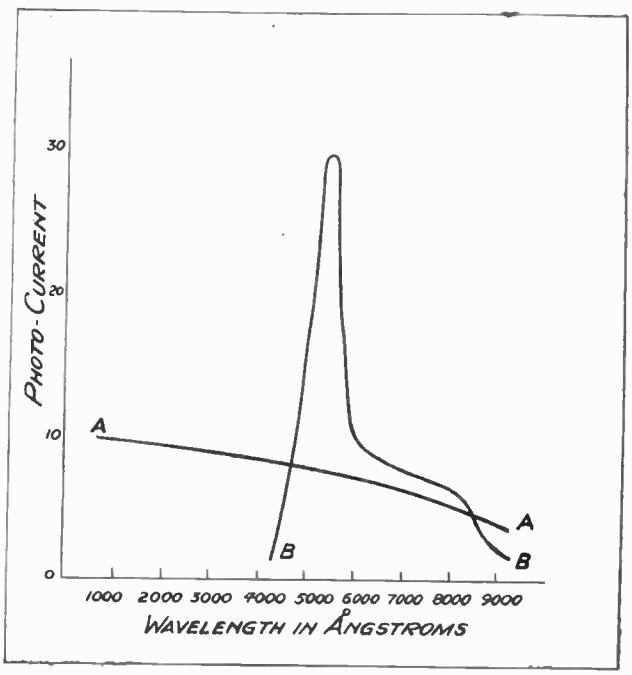


Fig. 2.—A shows an ordinary frequency current characteristic, while B is taken with equal spectral energies.

With an electro-positive electrode, in a solution of zinc or ammonium chloride, there will be electrolytic reduction of the oxide unless the cell is biased by a potential opposite to the electrolytic potential generated by the couple. Hence it is best to use a carbon or selenium electrode, and to have a solution of hydrogen peroxide present. The nascent oxygen from the peroxide solution will then oxidise the hydrogen generated by the couple, and the cuprous oxide will not be affected by long usage of the cell (see Fig. 4).

Trouble has been experienced, however, with these two previous cells, in that they possess a certain time lag, or inertia, and also that they have a very bad high-frequency response. At low frequencies the lag is negligible and the response is good, but above 1,000 cycles per second the time lag of the electrodes is so great that the response falls off almost to zero.

Overcoming Time Lag

It has been found possible to overcome these difficulties by inducing a surface change in the electrodes. The surface of the cuprous oxide is of a ruby red colour, and glass-like and smooth, as first prepared. If, however, it is immersed for a few hours in a concentrated solution of ammonium

chloride or zinc chloride, the surface becomes etched, and composed of a large number of large, uniform crystals of cuprous oxide. There is a slight chemical action, which results in the formation of a cupric-ammonia compound, but at the same time the large

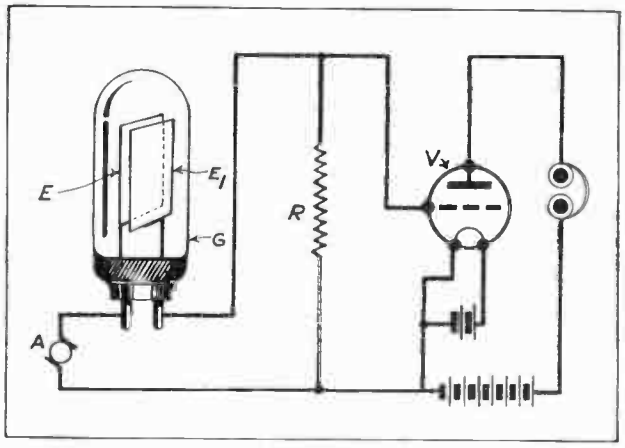


Fig. 3.—A cuprous oxide cell, Ruben's condenser type, together with the requisite electrical circuit.

crystals grow at the expense of the smaller ones, and we are thus left with all large ones. The exact mechanism by which this occurs can only be guessed at, and the explanation probably involves the use of colloid chemistry considerations. It is not necessary to go into this at present. This cell can be used for television, talkies, photo-telegraphy, sound recording, etc. In Fig. 5 we see the best construction of the cell. The cuprous oxide/copper electrode *C* is cylindrical in shape, while the co-operating electrode is of cadmium. The cadmium electrode *E* is placed so as to produce a minimum screening of the cylindrical sensitive electrode. The electrodes are mounted in beeswax or resin *B*, and placed in a tube *T* filled with a 0·1 per cent. solution of ammonium chloride.

The voltage changes from 0·1 millivolts to 0·5 volts with a change from dark to light. Above a certain light sensitivity saturation is reached, depending to some degree on the resistance of the external circuit. This type of cell does not depend on photo-voltaic effect, or on the generation of a potential, and it is sensitive to light of low intensity throughout the entire visible spectrum. As its response is an electro-physical one, it is capable of sustained operation over long periods with little variation of characteristics.

Preparing the Cuprous Oxide Electrode

Before proceeding to discuss further cells of a different nature, it is desirable to say a few words about the preparation of the cuprous oxide electrode. The reader should procure a piece of sheet copper, about 1/32nd inch thick, and this should be cut up into pieces of convenient size, say 1 inch by 1½ inches. A certain amount of experience is needed to obtain the best results, but one piece can be used a number of times for trial experiments. Have a small dish full of warm water in which 5 per cent. of glycerine has been dissolved. The temperature of the water should be maintained at about 50°–60° Centigrade. The copper is held in a small pair of tongs or tweezers, and heated in a Bunsen burner or blowlamp to bright red heat, corresponding to about 1,000° C. It is then immediately plunged into the warm glycerine water and the result should be a brilliant ruby red surface. If it is black, you may find that you are able to scale the black off, and reach the bright red underneath. It is sometimes advisable to dip the foil into glycerine before heating it, as the exact oxidising atmosphere is difficult to obtain. The foil should then be heated in a solution of ammonium chloride, any strength will do so long as it is fairly strong, say, saturated at room temperature. In some cases this assists in removing the black scale of cupric oxide, and the cuprous oxide layer underneath is disclosed by rubbing off the loosened black scale with a cloth.

It is best to get the correct technique and to prepare perfect ruby red surfaces. If such perfectly oxidised pieces are placed in cold saturated ammonium chloride for three or four hours, they will be found to be perfectly etched, while the liquid will have acquired a blue colour, due to the formation of a cuprammonium compound. It is now quite an easy matter to build one of these cells at home for less than a couple of shillings.

Easy to Construct

The next type of cell is the lead sulphide-silver cell, which again is quite simply made by the amateur. This cell is capable of even greater development than the former types, and the amateur can help since no

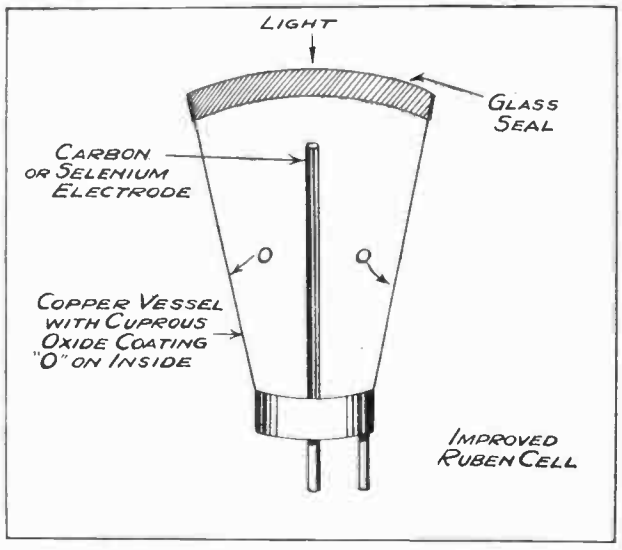


Fig. 4.—Illustrating an improved Ruben Cell.

costly material or apparatus is required. It has long been known that various minerals have light-sensitive properties, but these were so feeble that no use could be made of the phenomenon.

The whole secret seems to lie in the material which is used as a contact for the crystal, and it has been found that if a sharp silver point is used, and the

whole arrangement is embedded in a block of transparent resin, an extremely efficient cell results. One can see from the above brief description how easily the experimenter could construct such a cell. It does not require a high polarising voltage, as do selenium and the alkali metal cells, but a small potential may be necessary, and this is easily determined by experiment.

Using natural galena, the internal resistance is very low, usually between 500 and 1,000 ohms. Since the effect is localised at the spot where the silver makes contact with the galena the cell cannot be compared directly with other types, but used on talking picture outfits it gives ten times the response, from a volume point of view, to that given by alkali metal cells. For television the cell requires adapting to obtain a surface sensitivity. It is sensitive into the far infra-red, has no threshold, no saturation, and is free from lag and fatigue.

(To be continued.)

Book Review

The 1931 German Broadcasting Year Book

THE German Broadcasting Year Book of 1931 is of particular interest to English readers in that a short survey of broadcasting in Britain is given by C. F. Atkins, Director of the British Broadcasting Corporation. He explains briefly the general scheme of transmissions in Great Britain and illustrations are given of the transmitter at Brookman's Park and of the British Broadcasting House as it will appear when complete. Particular stress seems to be laid on the fact that it is possible to transmit different programmes on different wavelengths from aerials which are very close together.

The question of international broadcasting is discussed and the reproduction of foreign programmes in other countries. An excellent diagram is given of the linking up of different telephone lines in Germany showing how simultaneous broadcasting is effected.

The historical progress of broadcasting in Germany is very well dealt with. We are first introduced to the experiments of Heinrich Hertz, of Braun, Slavey and Arco of the last century. Then a brief description is given of the erection of the different broadcasting stations of a later date and the increase of listeners in Germany up to the present day. Mention is made of the opening of the first important Radio Exhibition in Berlin.

A Special Section

A special section deals with the transmission of ultra-short waves of 3 to 8 metres, and also a receiver dealing with the 80 to 180 centimetres. It appears from the article that there is a very wide avenue of reception in this connection with regard to the application of short waves for medicinal purposes.

Perhaps the most interesting article for the amateur dwells on the work and aims of the German radio amateur. We have a description of mains receiving sets providing varied outputs. Mention is made of a push-pull amplifier, an interesting device to raise the selectivity of any existing receiving set by impressing on the grid of the valve a signal 180 degrees out of phase of the income signal, this to cut out completely the interfering local station. For this special apparatus it appears a prize has been awarded by the State Broadcasting Company. Screened grid valves are included in the many and varied theoretical diagrams, and methods for smoothing mains-control sets are given.

Interesting Photographs

The Heinrich Hertz Institute, which has been mentioned before, and which deals primarily with investigations of the mechanical, acoustic, and electrical vibrations have published an interesting amount of material dealing with the disturbing noises

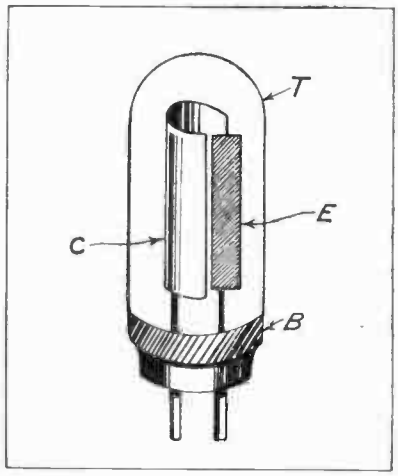


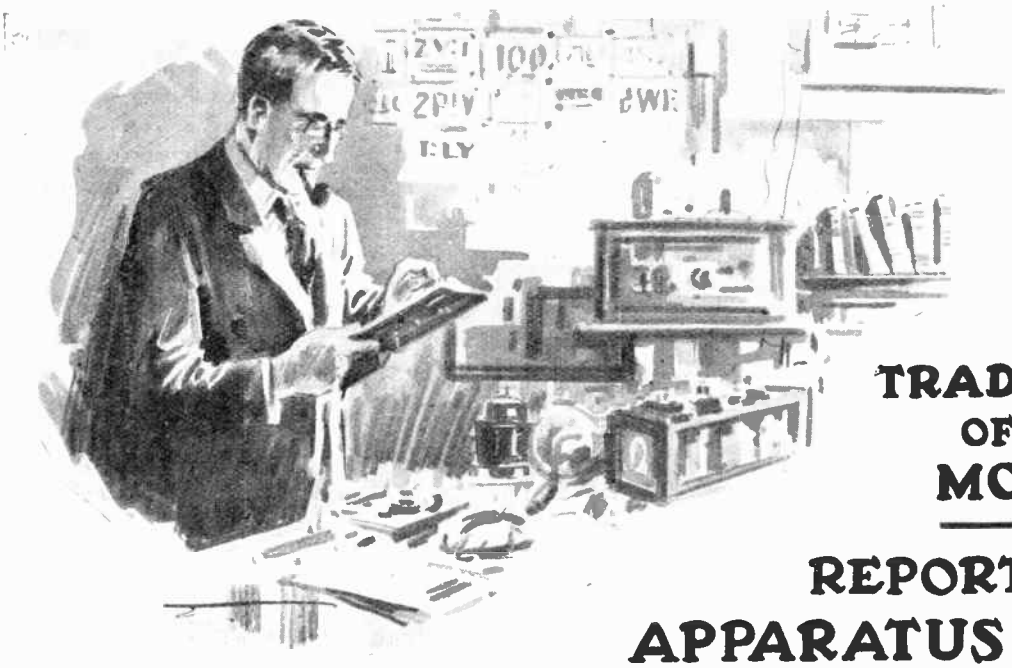
Fig. 5.—For talkie work, etc., this particular cell finds considerable application.

in the amplifiers, and description is given of the apparatus which investigates particular disturbance and distortion occurring in wireless amplifiers.

The whole book is supplied with interesting and beautiful photographs of various events connected with broadcasting, of poets and playwrights both German and English, and it is noticeable that of the plays broadcast G. B. Shaw's "Major Barbara" has taken one of the first places in the programme. It is very interesting to note in the programme how the very cream of literary production is culled from all over the world.

Undoubtedly the book provides for all tastes, whether technical or literary, poetical or mechanical, in connection with wireless.

L. MYERS.

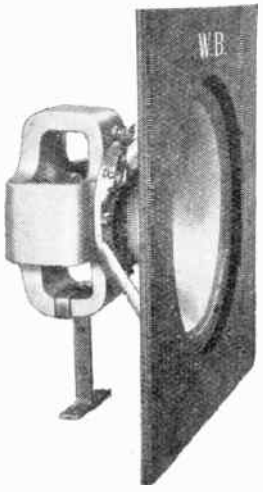


TRADE NOTES OF THE MONTH

REPORTS ON APPARATUS TESTED

W. B. Permanent Magnet Moving Coil Loud-speaker

WE have had an opportunity of carrying out a long series of tests on the new permanent magnet moving-coil loud-speaker of Messrs. Whiteley Electrical Radio Co., Ltd. Our tests indicated that the best output transformer for use with this loud-speaker is the Ferranti OPM3. With this combination the reproduction is most natural and pleasing on all types of transmissions, be they speech, music, or song. A fine crisp tone is revealed, while a very even balance is maintained throughout the musical scale—nothing boomy, nothing shrill. No signs of resonance were noticed, and the speaker is remarkably sensitive and handles a considerable input power without overloading.



The particularly efficient permanent magnet moving-coil loud-speaker manufactured by the Whiteley Electrical Radio Co., Ltd

For all-round performance of a permanent magnet moving-coil loud-speaker, this product of Messrs. Whiteley Electrical Radio Co., Ltd., can be placed in the first class and looked upon as a "reproducer of natural sound" (not noise).

Midget Wander Plugs

In introducing their midget wander plugs at a cost of 2*d*. each, Messrs. Belling & Lee, Ltd., are offering an article possessing nearly all the advantages of their higher-priced model. We have tested these wander plugs and find that they in every way fulfil the aims of the manufacturer. There is a side entry for the flex whereby the rubber, copper and fray are simultaneously gripped without tools. There are twelve titles available with neat, clear and permanent lettering. We found that the wander plug gripped all battery sockets from the largest to the smallest.

Messrs. Belling & Lee's, Ltd., latest product.

Three separate prongs of hard drawn segmental spring wire are riveted into the internal brass part and give exceptional adjustment and strength of contact. By the use of three prongs, side play is eliminated in a large socket as well as giving a good three-point contact. Owing to the small diameter of the plug it can be used in sockets near the edge of a grid-bias battery or through eccentric holes in a cardboard top battery, the small dimensions and side entry being advantageous in restricted spaces. Its only disadvantage, when compared with the larger plug marketed by the same firm, would appear to lie in that an extremely careless user might touch the metal while the plug is still in contact with the socket, whereas the larger plug has a second insulation member and is safer where very high voltages are concerned, particularly on mains apparatus.

Mullard Valve, Type P.M.2A

The P.M.2A valve manufactured by the Mullard Wireless Service Co., Ltd., is an entirely new addition to their range of valves, and takes the form of a 2-volt small power valve with a high mutual conductance. It is similar in appearance to others of the range, pins of the four-split banana type being fitted in the usual formation. The electrode assembly is mounted horizontally inside the bulb, the anode resembling somewhat a flat open-ended box. The characteristics are rated as follows:—

Filament Volts	2 V
Filament Current	0·2 A
Max. Anode Volts	150 V
A.C. Resistance	3,600 ohms
Amplification Factor	12·5
Mutual Conductance	3·5 mA/V
Retail Price	10s. 6d.

We were unable to test consistency of results, since we only had one sample, but in the sample we tested we found that the emission was rather higher than the rated value. The amplification factor was approximately the same as rated, and also the A.C. resistance and mutual conductance.

This valve makes a very efficient small power valve which will have a wide application in battery-operated portables where low H.T. current consumption is a very desirable feature. The grid swing input which the valve can handle is moderate, but against this we have the high amplification factor and low A.C. resistance which enables a relatively large output to be secured in spite of the small input. In addition, the valve proves very effective in the first stage of a L.F. amplifier suitable for television purposes.

Osram Valves, Type L.P.2 and Type P.2

The L.P.2 valve of the General Electric Company, Ltd., represents a new addition to the Osram range of valves and takes the form of a 2-volt small power valve. The electrode assembly is arranged at about 30 degrees to the vertical, and a filament of the double inverted V type is incorporated, being suspended at the apices on spring supports. The rated characteristics are as follows:—

Filament Volts	2 V
Filament Current	0·2 A
Maximum Anode Volts	150 V
Amplification Factor	15·0
Impedance	3,900 ohms
Mutual Conductance	3·85 mA/V
Retail Price	10s. 6d.

The sample we tested showed a remarkably high mutual conductance, with a slightly lower amplification factor than specified. Where economy in anode current is desirable this valve should serve admirably since it will handle at least a 12-volts grid swing at an anode voltage of 150, this being perfectly satisfactory for normal home use when employed in conjunction with a reasonably efficient loud-speaker.

The P.2 super-power valve manufactured by the same firm is similar in construction in appearance to the original Osram P.2, but the characteristics are greatly improved. In construction it is almost identical with the L.P.2 just described, and its rated characteristics are appended.

Filament Volts	2 V
Filament Current	0·2 A
Maximum Anode Volts	150 V
Amplification Factor	7·5
Impedance	2,150 ohms
Mutual Conductance	3·5 mA/V
Retail Price	13s. 6d.

In the sample we tested we found that the constants were sensibly the same as the manufacturer's rating. The valve makes an excellent super-power valve, being capable of handling a large grid swing, and this, together with the high amplification factor, permits of a large anode voltage swing. Under certain circumstances we found that the anode current was sufficient to produce a good television image, although it was felt that a super-power valve, capable of giving a somewhat larger output, would be more suitable for that purpose.

"Cairmor" Microphone

Messrs. Cairns & Morrison, Ltd., have sent along to us a "Cairmor" microphone for test. We found that the instrument was highly sensitive, being built on entirely new and original lines and embodying in its design both the transformer and the necessary battery, so that the whole apparatus can, without any further complication, be connected direct to the input of the wireless set. Fully covered by patents this microphone embodies several interesting and novel features so that the recording of both high and low frequencies, for example both the highest and lowest notes on a piano, can be undertaken with faithfulness.

We found it excellent for recording both speech and music, and it could be used quite well for public address work. We were able to pick up speech from a distance of about 20 to 30 feet, and in addition, when "addressing the mike" in a normal tone of voice, about a foot away from the instrument, there was a complete absence of blasting or overloading.

There are a large number of uses to which this microphone can be placed, and it will form a useful adjunct in many homes. In passing, it may be noted that it will form quite a useful baby alarm, so that the cries of the infant are heard by the parents superimposed upon the normal reproduction of the loud-speaker.

We can confidently recommend this instrument to our readers, and, since it is specially designed to give service in tropical climates, it will be seen that the apparatus in every way is a good investment at the price of 32s. 6d.

LETTERS TO THE EDITOR

The Editor does not hold himself responsible for the opinions of his correspondents. Correspondence should be addressed to the Editor, TELEVISION, *505, Cecil Chambers, Strand, W.C.2, and must be accompanied by the writer's name and address.*

FURTHER VIEWS ON SCANNING.

To the Editor of TELEVISION.

DEAR SIR,—I was interested in the letter of your correspondent, Mr. P. F. Carmichael, in the current issue in which he describes a scanning disc with two spirals, the holes of one being displaced radially half their breadth with respect to the holes of the other.

Mr. Carmichael appears to have had difficulty in obtaining flicker effects with sound broadcasts, and I would point out that at the speed (375 r.p.m.) at which he runs the disc quite independent images will be produced by each spiral and will not appear superposed, since retentivity of vision will be effective only during the period occupied by each spiral in scanning the image area. The result is that the image produced will flick back and fore from left to right over a distance equal to half the breadth of each hole and this will tend to "flatten out" the pattern produced by the sounds. If the speed were doubled the two images would completely superpose to give one image, and a satisfactory pattern would probably result.

Quite an appreciable amount of time elapses, however, before the strip scanned by the first hole of the second spiral overlaps the corresponding halves

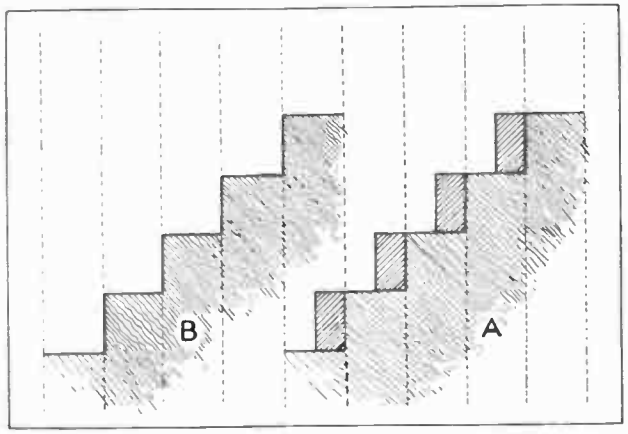


Fig. 1.—The diagram to which Mr. Wright makes reference in considering the query of discs with diamond shaped holes raised by Mr. Carmichael.

of the strips scanned by the first and second holes of the first spiral (and an equal period for subsequent strips), and a more even illumination and more effective superposition should result if the spirals were intermeshed, *i.e.*, calling the first spiral A and the second B, and denoting the holes of these spirals by the suffixes 1, 2, 3 . . . , if the holes came in the order $A_1B_1A_2B_2A_3B_3$ . . . , so as to form a *single* spiral of *two sets* of holes extending right round the disc. A disc of this type was described, and some of its advantages discussed, in my article, "More Light through the Scanning Disc," in the December, 1929, issue of TELEVISION (Vol. 2, No. 22).

The diamond-shaped holes adopted by Mr. Carmichael are of considerable interest, but he does not give his reasons (which should also be of interest) for using them. I would suggest that their principal advantage would be that the usual streaks due to slight inaccuracies in the positioning and cutting of the holes will be quite invisible, especially if the holes are arranged in the order suggested above; for if the corners of two holes of one set overlap (inadvertently) in scanning, the bright streak due to the small amount of extra light getting through will be swamped by the much larger amount of light passing through the centre part of the legitimately overlapping hole of the other set, and the dark streaks due to underlapping at the corners will be similarly swamped.

Yours faithfully,

GEORGE C. CATO

(Fellow of the Television Society).

"Roseville," 9, Balmoral Place, Aberdeen.

January 9th, 1931.

SCANNING DISCS WITH OVERLAPPING HOLES

To the Editor of TELEVISION.

DEAR SIR,—With regard to scanning discs with overlapping holes, the following considerations may be of interest to Mr. P. F. Carmichael.

Suppose that a vertical dark mark, whose width is nearly equal to that of a single track, occurs in the object, there are obviously two main cases which can occur in the transverse:

Case 1, in which the mark lies wholly in the track and will be reproduced as a slightly lighter mark, whose width is that of a single track in the receiver.

Case 2, in which the mark lies half in one and half in the next track and will be reproduced as a half-tone mark twice as wide as a single track in the receiver.

From these considerations, it is easy to see that the image formed by a disc in which the holes overlap will have a series of half-tone lines down it; and obviously, an image produced by a disc that has a slight space between the holes will have a series of dark lines down it.

Suppose now that discs were employed at the transmitting and receiving ends having two spirals of holes, one spiral in each half of the disc. The holes in each spiral being arranged slightly to *overlap* in the case of the *receiving* disc, but to leave a slight space between adjacent tracks in the transmitting disc, and in *both* discs one spiral has its holes nearer respectively to the centre of the disc than the corresponding hole in the other semicircle by an amount equal to half the width of a hole. The result would be an increase in diagonal gradation, as shown in Fig. 1 (A), compared with the gradation obtained by an ordinary single spiral disc, shown in Fig. 1 (B).

Thus a disc consisting of two spirals of, say, 30 holes each would be a definite improvement on a single spiral of 30 holes. However, equal gradation could probably be obtained with an ordinary disc of 60 holes.

It would seem, therefore, that the advantages produced by overlapping are discounted by the fact that, for a given width of picture, twice as many holes are required and consequently a greater sideband width.

Mr. Carmichael will find a description of a scanning disc in which the holes overlap in British Patent No. 321389 and U.S. App. 364177 (Baird). Various shaped holes, including diamond-shaped, are described in British Patent No. 331765 (Mihaly: Convention Germany); whilst multiple spirals are described in British Patent No. 314591 (Baird).

Yours faithfully,

E. E. WRIGHT.

80, Hambrough Road, Southall.

January 5th, 1931.

CAN READERS SUPPLY THIS INFORMATION?

To the Editor of TELEVISION.

DEAR SIR,—I am a constant reader, and have your paper on order from my newsvendor. I also possess and have read Volumes I. and II. Would you mind telling me, if you know, the amount of the time lag in most ordinary gas-filled electric light bulbs, *i.e.*, what fraction of a second or more is there between the cessation or commencement of the flow of current and the cessation or existence of light from the bulb—neglecting, of course, the persistence of vision?

It would be interesting to know how the answer was originally arrived at—perhaps photographically?

I must take this opportunity of congratulating you on your paper, which I find so tremendously interesting but all too brief. The looked-forward-to luxury of reading it once a month is all over in an hour or so. If I may make one other suggestion, it is that you might start a corner for the times of programmes, including the German (stating the number of holes to the disc), and any other country within reach that sends out television. Are the French not doing anything yet, nor the Dutch?

There must be a fair number of amateurs like myself interested in television. I should like to be able to buy in a handy volume—such as TELEVISION, Vols. I. and II.—a reprint of all Baird's and Baird Company's patent specifications, and in another volume all other and foreign specifications.

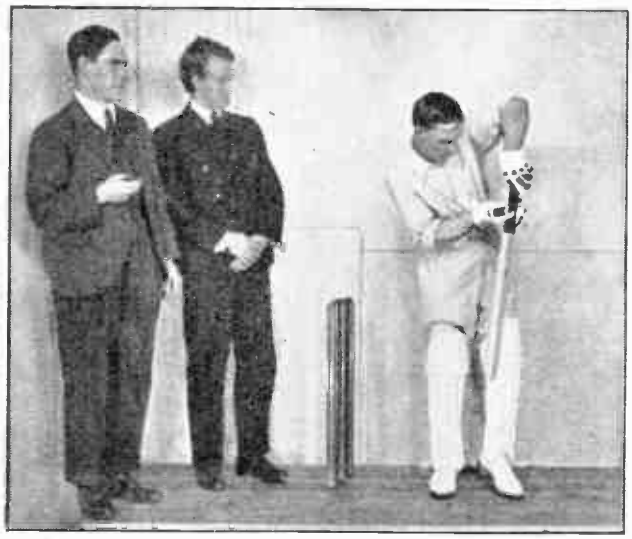
Yours faithfully,

E. WOTTON.

Durlock Lodge, Minster, Thanet.

January 8th, 1931.

[The comments of readers on the points raised by Mr. Wotton will be welcomed. In the meantime we append a mathematical contribution which may help.—ED.]



Major Church, D.S.O., M.C., M.P., and Mr. Baird watching Strudwick demonstrating his strokes for three-zone television.

LUMINOSITY OF A FILAMENT.

The cooling or heating of the filament may be calculated, given the following constants:—

m = mass of the filament.

a = area of the filament.

s = specific heat of the material.

β = temperature co-efficient of resistance of the material.

It is necessary to assume the Stefan-Boltzman Law for radiation, and if there is any biasing current or self-induction in the circuit due allowance must be made for these.

We have for the heating period

$$i^2Rdt - \sigma a\theta^4 dt = Jms \, . \, d\theta.$$

Where $R = R_0 e^{\beta\theta}$ = Resistance of filament, and

$$i = \frac{e}{\rho}\left(1 - e^{-\frac{\rho}{L}t}\right)$$

where e = e.m.f. applied.

ρ = total large resistance in circuit, which is practically unaltered by the change in R.

Thus if L is negligible i is a constant.

For the cooling period we have

$$\sigma a\theta^4 dt - i^2Rdt = Jms \, . \, d\theta.$$

with the appropriate values of R and i substituted, $d\theta$ now being the *fall* in temperature during the time dt.

With the boundary conditions the above is sufficient for the determination of θ in terms of t.

Having found the temperature-time relation, the luminosity-time relation is found from the visual-effect against temperature curve for tungsten.

E. E. W.

A QUESTION OF CONVERSION.

To the Editor of TELEVISION.

DEAR SIR,—I trust you will forgive me for troubling you on what is little more than a matter of simple arithmetic, but I was unable to arrive at the figures Sir Ambrose Fleming gave in the example of Einstein's theory, in the article on "Cosmic Radiation" in the December issue.

The sum consisted of the conversion of 1 gram. times the square of the velocity of light into horse-power, and the figure I arrived at, working by logs., was 18,480 h.p. for 1,000 hours, which was approximately the same as that I ascertained by simple mathematics.

As there must have been an error somewhere in my formula, I should much appreciate your reduction of the above to horse-power.

Yours faithfully,

R. E. JAY.

"Buckingham," 19, Dagmar Avenue, Wembley Hill.
January 7th, 1931.

SIR AMBROSE FLEMING REPLIES.

To the Editor of TELEVISION.

DEAR SIR,—In reply to the query of Mr. R. E. Jay, there is *not* any great error such as he suggests in my calculation on p. 417 of the December issue of TELEVISION. The details of the calculation are as follows: The formula for the conversion of matter into radiation energy is $mc^2 = e$ where m is the mass of matter in grams, s is the equivalent energy in ergs, and c is the velocity of light in centimetres per second.

Now $c = 3 \times 10^{10}$ and if $m = 1$ gram then $e = 9 \times 10^{20}$ ergs $= 9 \times 10^{13}$ watt-seconds. But 1 hour $= 3{,}600$ seconds, and 1 horse-power is 746 or 750 watts approximately. Hence $e = (9 \times 10^{13}) \div (750 \times 3{,}600) = 33{,}000 \times 1{,}000$ nearly. In other words, 33,000 horse-power working for 1,000 hours.

The only mistake I made was in not noticing that in the galley proof sent 35,000 was put for 33,000. In any case the correct figure with 746 watts = 1 h.p. is 33,512, and not 18,480. The error Mr. Jay has made is probably in taking $e = \frac{1}{2}mc^2$ instead of $e = mc^2$, which is the correct formula.

Yours faithfully,

AMBROSE FLEMING.

"Greenfield," Manor Road, Sidmouth.

BAIRD TELEVISION LIMITED AND THE GRAMOPHONE COMPANY, LIMITED (H.M.V.).

To the Editor of TELEVISION.

DEAR SIR,—We enclose herewith copy of letter addressed to our solicitors by The Gramophone Company, Limited, concerning the misuse by that Company of the word "Televisor," which is our Registered Trade Mark.

You are, of course, at liberty to confirm with The Gramophone Company, Ltd., the authenticity of this letter.

Yours faithfully,

BAIRD TELEVISION LIMITED.

(Signed) W. H. KNIGHT,

Publicity Department.

133, Long Acre, London, W.C.2,

January 15th, 1931.

[ENCLOSURE]

Messrs. Mayo, Elder & Rutherfords,
10, Drapers Gardens,
Throgmorton Avenue, London, E.C.2.

BAIRD TELEVISION LIMITED.

Registered Trade Mark "Televisor."

DEAR SIRS,—We have your letter of the 7th January and wish to state that the misuse of the word "Televisor" in the article to which you refer was inadvertent and that the occurrence is regretted by us.

We are at once taking proper steps with a view to ensuring that such misuse is not repeated.

Yours faithfully,

THE GRAMOPHONE COMPANY, LIMITED.

(Signed) W. H. COOPER,

Secretary.

Hayes, Middlesex,

January 10th, 1931.

Lectures for February

The following lectures will be given by Mr. J. DENTON, A.M.I.E.E.:—

FEB. 5TH.—"Television," at 6.15 p.m. The Lensbury Radio Society, 16, Finsbury Circus, E.C.2.

FEB. 12TH.—Borough Polytechnic, London, 8 p.m. (Continuation of Course.)

FEB. 16TH.—"Television and Noctovision," at 7.30 p.m. The Literary and Debating Society, Castle Gate, Nottingham.

FEB. 18TH.—"Television Progress," 7.30 p.m. The Tottenham Wireless Society.

FEB. 19TH.—Borough Polytechnic, London, at 8 p.m. (Continuation of Course.)

FEB. 26TH.—"Television Progress," at 7.30 p.m. Harrow Scientific Society.

Cards of admission can be had from Mr. J. DENTON, Television Society, 4, Duke Street, Adelphi, W.C.2.

The Baird Television Arc

HITHERTO the only available light sources for television have been the Kerr cell and the Glow discharge lamp. Of these, the Kerr cell has been the most brilliant modulative light source available.

The Kerr cell consists of two Nicol prisms between which is a glass container with two electrodes immersed in nitro-benzene. Light from an arc lamp is made to pass through the two Nicols and between these electrodes, the fluctuating potential from the television signal is applied to the electrodes. The Nicols are adjusted so that when there is no television signal the light is extinguished. The television modulated potential applied to the electrodes alters the plane of polarisation and allows more or less light to pass through. This device, although it permits an arc lamp to be used, allows only a very small proportion of the light from the arc to be utilised. Fifty per cent. of the light is immediately lost by polarisation and there are further large losses in penetrating the Nicols.

The new modulated light source was demonstrated for the first time in the Baird laboratories on January 2nd. This remarkable advance consisted in *modulating the arc itself*, current from a television signal being applied directly to the arc without the use of the Kerr cell. Remarkable success was achieved. The demonstration was given before representatives of the scientific press, including *Nature* and the technical representative of the *Times*. Television signals from the standard Baird transmitter as used in the B.B.C. broadcasts were applied to a specially adapted arc, and light from this arc was focussed by means of a condenser upon an aperture in a diaphragm, an image of the aperture being made to traverse a screen by means of a Weiller mirror drum with 30 mirrors.

The image produced was of intense brilliancy, and the detail and definition excellent. This gives to television a new modulated light source of much greater brilliance than anything hitherto achieved.

It is truly remarkable that the arc can be made to respond to the very high frequency involved in television, but none the less this has been done, and marks another milestone in television progress.

Commenting on this demonstration, *Nature* says: "the detail and definition of the received image were comparable to that received on the standard commercial 'televisor' receiver and the brilliance of illumination was remarkable. This demonstration of the successful modulation of the arc with television signals appears to open up considerable possibilities, and the television arc would appear to have a useful future."

The Television Society

THE fourth meeting of the session was held at University College on January 14th, at 7 p.m., when "The Progress of Television in Europe and America during 1930" was considered by aid of the following papers:—

Germany.—By a paper read by Captain R. Wilson (Fellow), following his visit to Germany.

America.—By papers contributed by G. M. Neale (Assoc.) and J. H. Owen Harries, A.M.I.R.E. (Fellow) both of which papers were read by W. G. W. Mitchell, B.Sc. (Lecture Secretary); and also by E. G. Lewin, M.Sc., A.Inst.P. (Fellow), who gave a short lecture, illustrated by lantern slides, on two-way television on telephone lines as experimentally installed in U.S.A.

Captain Wilson described the television apparatus exhibited at the German Radio Exhibition, this section being curtained off to secure semi-darkness. Details of the various exhibits were given, and the results of the working apparatus compared. Reference was made to the Telehor Co. Television Talkie demonstration, and to the Fernseh A.G. outfit, which included a sixty-seven hole scanner, giving twenty-five pictures per second. The German Post Office were responsible for all broadcasting.

The paper communicated by Mr. G. M. Neale specially referred to amateur interests in Canada and U.S.A. In the U.S.A. there are over twenty stations transmitting television programmes, and for the most part daily. Mr. Neale indicated that the large American corporations as the General Electric Co., Westinghouse, and Bell Telephones, etc., were aiming at ultimate perfection for future exploitation; whilst, on the other hand, there were others, as Jenkins Corporation, "seeking to popularise simple inexpensive existing systems for public use." The forty-eight-hole disc is fairly general in the U.S.A., though all attempts to standardise the number of holes have proved unsuccessful.

Synchronisation is in most cases secured by the use of synchronous motors.

The Westinghouse Co. are developing the Zworykin Receiver, employing the kathode ray in conjunction with a band-pass-filter.

Mr. J. H. Owen Harries supplied tabulated data, comparing the Baird, Bell Laboratories, Westinghouse Co., and Jenkins Corporation systems as known.

Mr. E. G. Lewin gave a very interesting account of specially installed experimental two-way television in conjunction with the telephone. Description by aid of lantern slides was given of telephone boxes where a blue scanning ray at each end of a two-mile line permitted speakers to be seen as well as heard, a mild orange light being used for general illumination.

At the close of the meeting members inspected a Jenkins Receiver, specially brought over from U.S.A. by Captain Wilson.

In the unfortunate absence of Dr. Tierney, due to an attack of bronchitis, the chair was occupied by Mr. Mitchell, who ably conducted the proceedings.

The papers and lecture will be published in the Proceedings of the Society, and will be forwarded free to all Fellows and Associates whose subscriptions are fully paid.

Members are reminded that all subscriptions became due on January 1st last, and they are requested to forward same to the Treasurer, Television Society, 4, Duke Street, Adelphi, W.C.2. Intending new members can obtain all particulars and conditions for membership by applying to the Hon. Secretaries at the above-named address.

J. DENTON, A.M.I.E.E.,
Hon. Secretary (Members).

A Notable Anniversary

IT would be inappropriate in a magazine of this nature to allow the present month to pass without some mention of the name of Heinrich Hertz, whose brilliant researches formed the foundation upon which the modern science of radio communication has been built.

Hertz, who was born at Hamburg on February 22nd, 1857, distinguished himself at the early age of twenty-three by winning the prize offered at Berlin University for his paper on "Kinetic Energy of Electricity in Motion." A few months later he received his degree for a further thesis on induction in rotating spheres.

After working for three years as assistant to Helmholtz, Hertz journeyed to Kiel, where he began an investigation of Clerk-Maxwell's, then little valued but now famous, theory of electro-magnetism.

In 1885–89 Hertz demonstrated, for the first time, the propagation of electro-magnetic waves through space, measured the velocity and the length of these waves, and proved their nature to be identical to that of waves of heat and light. Thus, by conversion into experimental fact of Maxwell's theories, was born the science of wireless in all its forms.

In 1889 Hertz was appointed to a professorship at the University of Bonn, where he died five years later at the age of thirty-seven.

The most fitting tribute possible is paid to the memory of this brilliant and much-loved scientist by our association of his name with the waves used in radio communication.

L. P. D.

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