Vol. 3 NOVEMBER 1930 No. 33 25 CENTS MONTHLY

TELEVISION

SIR AMBROSE FLEMING
D.Sc., F.R.S.
writes in this issue

THE WORLD'S FIRST TELEVISION JOURNAL.

"Television To-day and To-morrow"

SOME PRESS OPINIONS

DAILY NEWS

"Many secrets of the apparatus used are revealed in detail for the first time in this book, together with full technical information about the system, put in simple language specially for the wireless amateur."

ELECTRICAL TIMES

"This book is of very considerable general interest. It sets out very clearly the outstanding developments and achievements in the evolution of television broadcasting."

YORKSHIRE POST

"The book is neither dull nor formidable for the non-technical reader; in addition to the diagrams, this book is excellently illustrated by almost fifty photographic plates."

ELECTRICAL REVIEW

"The illustrations are good, well chosen and interesting, while the diagrams and sketches are numerous and clear. It is well worth careful perusal by anyone interested in this entertaining subject."

ABERDEEN PRESS AND JOURNAL

"The subject of television is dealt with in an admirable and non-technical manner, and we are led through essentially intricate phases to a clear appreciation of what has been done, what takes place, and the possibilities for the future."

SUNDAY GRAPHIC

"Every branch of the subject is simply but exhaustively dealt with, and both principle and practice are made abundantly clear; it is a book for the expert or the beginner."

BIRMINGHAM DAILY MAIL

"It is at once one of the most authoritative books on the subject yet published in this country, both as an historical outline of the research and the many demonstrations that have been given during the past few years, and as an exposition of the technical processes involved in this new and astonishing development in the science of wireless."

NOTTS GUARDIAN

"The authors have kept in mind the fact that many persons interested in wireless have no very deep knowledge of electrical matters, and have written a book which the amateur will readily understand."

BIRKENHEAD NEWS

"It is essentially a book for the person who knows little or nothing about television, and is so simply written, so free from those technical terms which often mar a book otherwise good, that even the most untechnically minded of us are able to understand it."

PRICE
7/6
POSTAGE
SIXPENCE
EXTRA

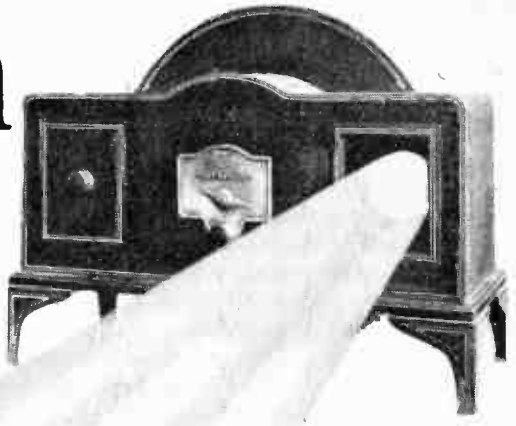
By SYDNEY A. MOSELEY
and H. J. BARTON CHAPPLE, B.Sc.(Hons.), A.M.I.E.E.

Obtainable from

TELEVISION PRESS, LTD.
505, CECIL CHAMBERS, STRAND, LONDON, W.C.2.

Principal Contents

Television put to its *first* commercial use!



at the HAIRDRESSING FAIR *of* FASHION

No Eugène Wave is genuine unless given with this Sachet

Acknowledged leaders in their own field, Eugène Ltd.—Perfecters of the permanent wave—have been the first also to discover a real commercial use for Baird Television — that intriguing development of wireless science.

At our Stand just inside the Main Entrance at the forthcoming Hairdressing Fair of Fashion, Olympia (Nov. 5th to 13th), visitors will be able to see an actual demonstration of the famous Eugène Method transmitted and received by Baird Television, and will learn how the patented Eugène Sachet coaxes the hair into soft, lovely, natural waves.

Be sure you get a genuine Eugène Wave with the genuine Eugène Sachet.

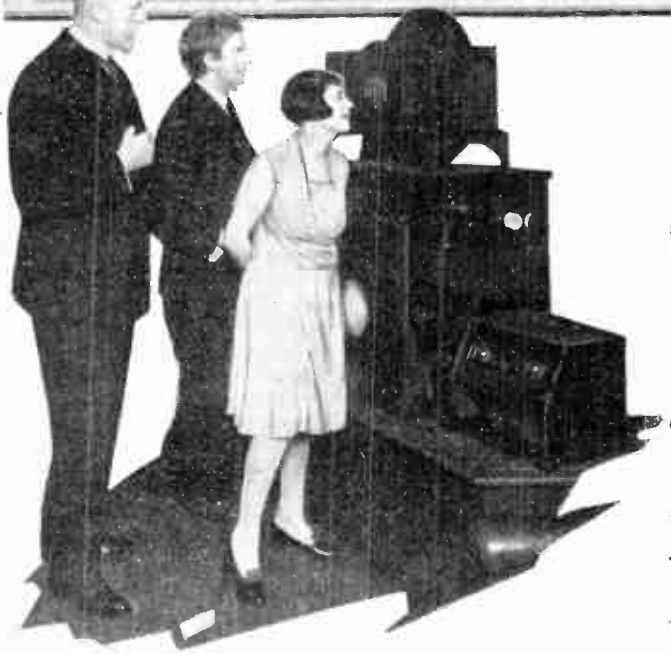
Booklet describing the Eugène Method and specimen Sachet free on request from

EUGÈNE LTD.,
31, DOVER ST., PICCADILLY, W.1.

eugène
PERMANENT WAVES

PARIS : NEW YORK : BERLIN : SYDNEY

TELEVISION



THE
OFFICIAL ORGAN OF
THE TELEVISION SOCIETY

SYDNEY A. MOSELEY, *Managing Editor.*

Consultants { C. TIERNEY, D.Sc., F.R.M.S.
W. J. JARRARD, B.Sc., A.R.C.S., A.I.C.

VOL. III] NOVEMBER 1930 [NO. 33

THIS MONTH'S CAUSERIE

OUR columns this month give very full details of the success which attended the demonstration of Baird screen television at the Scala, Berlin. Local difficulties were met with by the engineers entrusted with the installation of the apparatus, but these were soon overcome.

Tribute has been paid to our German associates who contributed their quota in the making of scientific history, and it has been our pleasant duty on more than one occasion to give credit to those responsible in that country for their very open-minded attitude towards television.

To New Readers

Another event which is still fresh in our minds is the recent Radio Exhibition at Olympia. The TELEVISION Magazine was on sale on the Baird Company's stand, and to the hundreds of purchasers of the journal for the first time we extend a hearty greeting. We hope that we may count upon you as regular readers from now on.

Editorial, Advertisement & Publishing Offices:

Television Press Ltd.,
505, Cecil Chambers, Strand,
London, W.C.2.

Telephone: Temple Bar 8169.

Subscription Rate. 7/6 per annum, Post Free.
American Rate, $2.50 per annum, Post Free.

MSS. and other material for Editorial consideration should be accompanied by a stamped addressed envelope, and should be typewritten.

On page 353 will be found an order form which can be filled in and handed to your newsagent. This will ensure the regular delivery of your copy, or, alternatively, an annual subscription of 7s. 6d., sent direct to 505, Cecil Chambers, will bring you twelve monthly issues, delivery being post free.

The future of television depends very largely on your whole-hearted support, and in order to keep in touch with progress it is fitting that the only journal devoted exclusively to television in this country should be read regularly by all who have that cause at heart.

Features of the Month

Television has a worthy supporter in the person of Sir Ambrose Fleming, D.Sc., F.R.S., and we welcome his contribution on a most intriguing scientific discovery.

With his characteristic vigour he unfolds a wonderful story concerning wireless signals coming to us from the confines of the universe and " clears the air " on matters of vital interest.

Mr. Sydney A. Moseley, who went to Berlin with the big screen, gives an insight into the points which cropped up during his stay in that city, and includes a list of some of the leading politicians and artists who lent their aid to this first continental demonstration.

An item of particular constructional interest appears from the pen of Mr. H. J. Barton Chapple. Good results from your television apparatus can only be assured if the receiver handling the vision signals is functioning satisfactorily. Our contributor shows you how to construct a testing unit which will enable all the important measurements to be taken with ease, and we are convinced that this will prove a boon to our readers.

Berlin's largest music-hall, the Scala, with its sign " Fern-Sprech-Sehen," announcing the demonstrations of Baird screen Television.

Other features of topical, theoretical, and general interest will be found to suit every taste, and the comments of readers are invited, together with suggestions for articles which are required to elucidate any problems connected with their television experiments.

Trade Notes

You will find that we are introducing this month an item which we intend to make a regular feature. This is our Trade Notes of the Month. We receive so many enquiries from readers as to where they can obtain apparatus, coupled with queries as to quality, that we feel the need will be met best by dealing with a number of products each month, giving the results of our tests and recommendations.

Naturally we invite the trade to furnish us with catalogues and details of their new products as they are marketed, as well as apparatus for test, for in this way we shall make the feature of real importance to our readers.

" Waves over the Waves "

We were rather intrigued by the announcement quoted above. It emanated from Messrs. Eugene, Ltd., who, at the Hairdressers' Exhibition at Olympia, are making a very novel use of Baird television. From a transmitter on the first floor this company will transmit over land lines to " Televisors " on the ground floor the latest points on permanent waving.

A few simple but essential features will be demonstrated and, at the conclusion, a model with her hair completely waved will show conclusively that television can reproduce a wealth of detail which some sceptics still think is impossible.

Television Facilities

In reply to many correspondents, the new Baird station will be open within a short period. This station is now in course of construction at Kingsbury, near Hendon, and is licensed by the Postmaster-General to employ two wavelengths and will be controlled by the Baird interests.

The transmissions will, at first, be only of an experimental nature, both wavelengths of 49½ metres and 155 metres being used for the radiation of vision. It is stated that the power used will be 900 watts.

The two wavelengths have been allocated to the Baird Company so that their engineers can determine the " carrying properties " of the two waves, and the available sideband will be 30 kilocycles. Readers will appreciate, therefore, that it should then be possible to transmit considerably more detail than can at present be accomplished with the 9-kilocycle allocation used through the B.B.C.

The call sign of this station is 2TV, this being the call sign allocated to Mr. Baird for the original television transmissions which took place from Motograph House. It is worth recalling that this original licence for 2VT was the *first experimental television licence in the world*, and it is fitting that the same letters should be used for the station which is now being erected.

First Lady Violinist to Televise

One of the most interesting transmissions which takes place from time to time is that of a violinist. Several appreciative letters have been received regarding the playing of Miss Mercia Stotesbury, who is now known as " the first lady violinist to televise."

Miss Stotesbury's violin can be distinctly seen in the " Televisor," and she herself happens to have an ideal face for television, so that next time she broadcasts we recommend readers not to miss looking-in.

THOSE GHOST IMAGES

FROM time to time the columns of our magazine have contained references to ghost images which apparently have puzzled those watching them on their vision apparatus. In view of this we have pleasure in quoting an extract from a Bristol newspaper in which prominence was given to an address delivered by Prof. E. V. Appleton. It will be seen that the lecturer offers an explanation of the phenomena, and due acknowledgement was made to one of our readers, Mr. W. B. Weber, for his assistance in supplying ghost image data.

Wireless Echoes

Prof. Appleton's Tribute to Bristol Amateur

Appreciative reference was made by Prof. E. V. Appleton, the well-known authority on the Heaviside layer and the phenomenon known as "Wireless Echoes," in the address he gave at the Victoria Rooms last night, to the first very excellent data given him by a Bristol wireless amateur, Mr. W. B. Weber, of Balmoral Mansions, whose Sunday morning transmissions are well known throughout the city. In fact, the information sent by Mr. Weber in response to the lecturer's appeal for data on any "ghost" images in television transmissions had proved most helpful in the research work done by Prof Appleton, and in addition the diagrams sent by Mr. Weber were thrown on the screen to illustrate a point in the address.

There was a very large and distinguished audience present, including Sir Oliver Lodge, the distinguished scientist, who presided, and who referred to the lecturer as the man who knew as much about the echoes as anybody. The Lord Mayor was also present.

In speaking of the mystery surrounding the echo often noted in Morse transmission, telephotography or television when being sent from a distant station on short waves, Prof. Appleton said some of these echoes exhibited a wide diversity of types, some of which could be accounted for, but others remain a mystery. To a practical man using wireless for the transmission of Morse, etc., the echoes were somewhat embarrassing, as they gave rise to multiple signals, and in television at a great distance the image of the person televised was often accompanied by a "ghost" image just peering over the head of the main one. This was where Mr. Weber's data proved so useful.

Very Accurate Timing

The scientific interest of these, however, was very great, for their investigation was yielding information that could hardly have been obtained in any other way. In almost every case it is considered that the waves causing the echoes have made one or more journeys into the upper regions of the atmosphere and back, so that their retardation in time behind the main signal can be explained. Usually the echo occurs about one-thousandth of a second after the main signal, so that very accurate timing methods have had to be devised to measure the intervals. At present the timing can be carried out to a hundred-thousandth part of a second. In other cases the echo signal comes so long after the main one that an ordinary stop-watch can be used, the delay often amounting to as much as half a minute.

These echoes of long delay are the most mysterious of all, and there is much diversity of opinion as to their origin. Prof. Störmer, the distinguished Norwegian scientist, suggests that they are due to waves which have penetrated the Heaviside layer and journeyed into outer space, ultimately being reflected by a vast stream of electricity shot out by the sun. To obtain further evidence on this point, the French Eclipse expedition to Indo-China last year made special observations on short wave echoes and found that, at totality, the echoes disappeared, although they were clearly heard before and afterwards. This result has been argued as being against Störmer's theory, but the matter cannot be said to be settled definitely yet.

Mr. Weber, who rendered such valuable assistance to Professor E. V. Appleton with his ghost images, is here shown seated operating the controls of his Baird "Televisor."

Sir Oliver Lodge proposed a vote of thanks to the speaker, and this was seconded by Dr. Conelly, of U.S.A.

The Big Screen in Germany

By Sydney A. Moseley

READERS who followed the epoch-making demonstrations of the big screen at the Coliseum, London, will no doubt be equally thrilled to hear that similar demonstrations were given recently in the Scala, Berlin's largest music-hall.

A good many wiseacres shook their heads when it was suggested conveying the whole paraphernalia from London to Berlin. They pointed out that, while possible under the best conditions at home, the difficulties that would be encountered in attempting an experiment of such a nature in a foreign country, where all the conditions were new, and after the apparatus had had to withstand the joltings and joggings of the lengthy journey, would be well-nigh insuperable.

Miss Maud Hansen, the first German girl to appear in Berlin with the Baird screen, is here seen at the studio in Friedrichstrasse.

The pessimists, however, were, as usual, confounded, and the transmissions which took place twice daily for a fortnight were a pronounced success.

At the same time certain inevitable snags manifested themselves at the onset. Local electricians, who were confident that they could supply all the needs of the Baird engineers, were rather misinformed as to the true state of affairs.

For instance, at the Scala Theatre those responsible stated that the electrical supplies were 200 volts A.C. and 200 volts D.C. When the Baird engineers arrived in Berlin and were settling down to begin the experiment, lo and behold it was found that the supply was 125 volts A.C.

Did they despair?

They did not. With the aid of the Baird associates in the Fernseh A.G.—you know, the sister German company in which the Baird Company is a partner—these difficulties were soon overcome and in particular my friend, Dr. Goerz, who is managing director of the Fernseh A.G., proved a tower of strength.

Let me give you some idea of what was needed in order to show the German people that big screen television was something more than mere talk.

There was, first of all, the studio to fix up. One had to find two or three empty offices and completely equip them in a short space of time with benches, tables, heavy curtains, floor matting and a thousand and one gadgets which the amateur especially will appreciate.

Within a week three offices were transformed into a studio, transmitting room and engineers' offices. In addition, of course, there was a reception room.

All that was at *one* end.

At the other end, the Scala, equal difficulties were encountered. Here again some of the data supplied to the Baird engineers proved to be incorrect. For instance, take one "detail." The measurement of the stage door was given as such that it would have enabled the caravan containing the screen to enter on the stage without mishap.

When the caravan at length arrived at the stage door it was found that the door was too small!

Again, did the pioneers despair? Again the answer is, they did not! The stage manager of the Scala and his men set nobly to work and knocked down many inches of the wall of two or three feet in thickness! All through the piece the whole staff of the German theatre helped enthusiastically. General-Director Marx proved a first-rate sportsman in the whole business. He readily appreciated the fact that in presenting television on the big screen for the first time

in Germany he was making history for the Scala—by the way, one of the finest theatres I have ever seen.

The greater question of electrical power was met by Dr. Goerz supplying immediately a special generator which was brought post-haste from the Zeiss-Ikon works at Zehlendorf. Then, mark you (and this was a new experiment so far as foreign land lines were concerned), the distance between the studio in the Friedrichstrasse and the screen on the stage of the Scala Theatre was no less than seven kilometres. Wiring to the extent of three additional kilometres was necessary, so that between the studio and the screen there was no less than ten kilometres of wire. In London the distance between the Baird Studio and the Coliseum was a matter of about a quarter of a mile.

Then, again, a new amplifier was being tried out and one would not be able to tell until the last moment whether it would " work " or not !

Well, this gives an impression of the magnitude of the experiment, and of the risks taken by the Baird Company to put Britain on the map in Germany so far as practical television was concerned.

After all, in order to achieve big things one must take some risks.

The arrangements were that the demonstrations should start on the Monday, and actually all the difficulties were overcome by that time, although some disappointment was experienced in not being able to give a special press demonstration the previous day.

But when the screen was seen for the first time in public in Germany general amazement was expressed, not only by the lay public, but by the body of interested scientists, both in Berlin and other parts of Germany.

No fewer than 26 performances were given, and from beginning to end there was not a single hitch. Indeed, it was the unanimous opinion of the Baird engineers that the picture was even better than that shown at the Coliseum, London. This, I think, is a remarkable achievement considering the language difficulties and the local technical problems.

There was, of course, another trouble to overcome, and that was in regard to artistes. But here Captain Pogson, of International Productions, Ltd., came in very handy with his perfect knowledge of German, and the artistes whom he engaged proved most satisfactory.

There was Max Steidl, the well-known comedian, who sang one of Germany's popular songs and could make extraordinary grimaces; Mr. Wolff Scheele an accompanist, whose face came over very well; and last, but not least, an excellent young German soubrette, Maud Hansen, who sang not only with charm but with an intelligent understanding of the needs of the " Televisor." Fraulein Hansen, in fact, scored an immense success, and was immediately offered engagements on the strength of these television performances.

Despite the rush in which proceedings were arranged, many of Germany's notable politicians and artistes came to the studio in the Friedrichstrasse to be televised. Among them were Dr. Bredow, the " Sir John Reith " of German broadcasting who appeared twice, Max Steidl, Senta Soneland (German " Marie Lloyd "), Dr. Herold, editor of the *Munich Medical Weekly Review*, physician to ex-King Amanullah, Evelyn

Dr. Paul Goerz, Chairman of the Fernseh A.G., who rendered such valuable assistance while the large screen was being shown in Berlin.

Holt (famous screen and film star), Hans Erwin Hey (famous opera singer), Felix Josky (popular author and poet), Kurt Vespermann (Germany's " Charles Hawtrey "), Manni Zeiner (revue star), Henri Lorenzen, N. A. Pogson, Hans Jungermann (German " Sir Charles Wyndham "), Marianne T. Winkelstern (the German " Pavlova "), Max Mensing (from the Berlin Grand Opera House), Gertrude Hesterberg (the German " Lily Elsie," leading in *The Merry Widow*), Ines Monlosa (stage and screen star), Leo Monosson (from the Neues Theater am Zoo, in his famous song *The Valse in the Sleeper*), Manny Ziener (revue star), Ludwig Manfred Lounnel (famous comedian), Paul Heidemann (of the State Opera, Berlin), Dr. von Bredow (Secretary of State), Erika Aderholt (famous actress), Minister of State Dominicus (Minister of Health and Air), Wilhelm Bendow (operatic singer), Captain Hermann Kohl ocean flyer (" Bremen." Kohl and von Huhnefeld), Elisabeth Pinajeff (Germany's " Greta Garbo ").

Altogether one more notable chapter in the fascinating history of Baird television.

I have not had an opportunity of dealing with all the letters that have been sent to me recently, but I most quote one from Mr. Thomas Bamford, of Bognor Regis, in which he says:

"Apropos of your article 'Enemies—and Friends—of British Television' in the August issue of TELEVISION, the following conversation overheard by me may interest you. The conversation is between a prospective buyer of a Baird 'Televisor' and the representative of a local radio service company. Prospective Buyer: 'Well, are you doing anything in television yet?' Representative: 'No, madam, we are not.' P.B.: 'Oh well, I am thinking of buying a Baird "Televisor."' Rep.: 'I strongly advise you not to invest in a Baird.' P.B.: 'Indeed—why?' Rep: 'They are not good, and the cost would be about £80 to fix one up completely. Besides, there is a German set shortly coming on the market which is very much superior and cheaper.' P.B.: 'Really? And whose set is that?' Rep.: The ——, and I strongly advise you to wait until that is on the market.' Other details of conversation followed, hardly worth mentioning, but I have given enough to illustrate the 'unfriendliness' to British television by a firm which has, I believe, branches all over the country."

Nipkow is a name which will always be associated with Television, for to this gentleman must be given the credit of the first scanning disc. He is seen here in the good company of Dr. P. Goerz (left) and Mr. Moseley (right) in Berlin.

Congratulations to *Montreal Star* for an excellent radio number, particularly since the paper devoted a good deal of space to television and does not forget the British end of it. Altogether a wonderful issue.

I find I am indebted for the receipt of this wonderful paper to Mr. W. Lord, of Coolebrooke Avenue, Montreal, who writes to me as follows:

"I am taking this opportunity to send under separate cover a copy of the radio number of the *Montreal Star* to give you some idea of what is doing in the metropolis of Canada with regard to television and radio. I have read with pleasure your article in TELEVISION, having the honour to be an associate and foreign correspondent. It is to be regretted that there are not a few more Britishers like yourself to put the 'spike' in those dismal jimmies who do all they can to discourage a fine British invention. I only wish that my own countrymen would get 'wise,' as they say in this country, to the fact that America is out to dominate the world's trade, not only in television but in everything.

"Any man in England who does not encourage British television deserves to be black-listed. We are to keep the U.S. from dominating the television field.

My advice to those in authority is to advertise as they have never done before, especially in Canada, the merits of our British invention, television, and if there is anything I can do please do not hesitate to get in touch with me.

I trust that the foregoing will not be misinterpreted, but appreciated as a sincere desire on my part as a Lancashire man to place British television where it belongs as the 'World's Standard.'"

Cosmic Radiation

Or, Wireless Signals coming to us from the Confines of the Universe

By *Sir Ambrose Fleming*, D.Sc., F.R.S.

AN extremely interesting discovery has been made of late years as the outcome of much research on the causes of the leakage of electricity from electrified conductors suspended in air.

That discovery consists in the detection of a kind of invisible light, which cannot affect our eyes, but comes to us from the most distant parts of the Universe. This dark light, or radiation as it is scientifically called, is so penetrating that it can pass through a wall of lead 18 feet thick or through 200 feet of water—that is, down to the bottom of a very deep lake.

It is passing through our bodies and houses day and night. We cannot escape from it except by going down to the bottom of a deep mine. Whether that radiation is helping to keep us alive or assisting to shorten our lives we do not know, but the fact of its existence is quite certain.

Sir Ambrose Fleming, D.Sc., F.R.S.

Neither can we tell if it has any utility in the economy of nature—that means, whether it serves any useful purpose—but we can hardly doubt that it does fit in somewhere into the scheme of things, and has effects even if at present unknown to us.

Visible Light

This radiation is now called the Cosmic radiation. The word Cosmic implies that its origin is somewhere in the material Universe or Cosmos, and, as will be explained later on, there is some reason to believe the place of its birth or origin is in the great spiral nebulæ which are the most distant objects in the universe of stars.

To make plain the probable nature of this radiation it will be necessary to explain some things concerning the nature of a more familiar thing, namely, a ray of eye-affecting light which can affect our eyes, and, therefore, is the means by which we see.

The first and most important fact about visible light is that it takes time to pass from one place to another.

Its speed, however, is so great that we can only detect it by very special means. It was first done by an astronomical observation made by Olaus Roemer in 1675.

The planet Jupiter is surrounded by nine moons or satellites, four of which were discovered by Gallileo with his first telescope. These moons pass periodically in front of or behind the planet or are eclipsed.

The time of revolution of each moon soon became known, and hence the time of each eclipse could therefore be predetermined. It soon was noticed that the eclipses of any given moon seemed to happen a few minutes earlier or later than the predicted time according to the relative position of the earth and Jupiter, and Roemer correctly surmised that the extreme range of this variation, which is about sixteen minutes, was the time taken by light to travel across the diameter of the earth's orbit, which is a distance of about 186 million miles.

A Time Factor

Now the sixteen minutes is nearly 1,000 seconds, and hence a ray of light must travel 186,000 miles in a second, or nearly 1,000 feet in the millionth part of a second.

Since that date other experimental means have been found, which it would take too long to explain, for measuring the speed of light, and the best results agree in giving a velocity of 186,356 miles per second or 299,900 kilometres per second.

When anything takes time to travel in this manner it can only be one of two things, viz., an actual

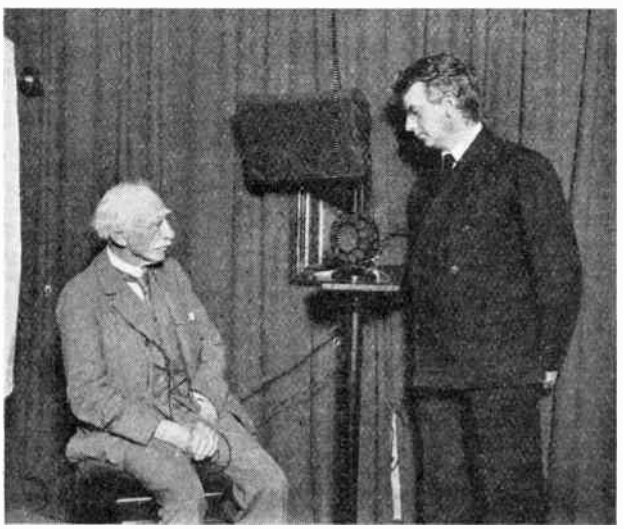
substance transmitted or else what is called a wave motion. For instance, the bullet from a rifle or shell from a gun takes time to pass from place to place, and retains its identity during its journey.

But now there are other effects which take time to travel which are not material objects, such as sound. We know that when a gun is fired at a distance we see the flash of the explosion or smoke before we hear the bang.

Observation shows that the sound travels, at ordinary temperatures, at about 1,100 feet per second, so that if five seconds or so elapses between the lightning flash and the thunderclap the storm is nearly a mile away.

Air Waves

The physical effect in the air is something as follows: The explosion of the gun or the lightning flash causes



The faith which Sir Ambrose Fleming has in television needs no reiteration in these columns. Here we see the renowned scientist with Mr. Baird on the occasion of the inauguration of the Baird transmissions from a B.B.C. station on September 30th, 1929.

a sudden compression of the air at its locality. But that increase in pressure is not felt everywhere at once, but only over a limited spherical region. This compressed air immediately relieves itself by making a compression in an adjacent outer zone, and this again in a more remote one. Hence a state of compression in the air is passed on from place to place. The actual motion of the air particles is very small, and each air particle is only very slightly displaced. This propagation of a state of compression is called an air wave.

A Medium Required

There are many different kinds of wave. For instance, if you watch the waves on the sea rolling inwards to the coast it appears as if a set of humps or elevations on the water was actually moving towards you. If, however, these humps pass under a boat or other floating object we notice that the effect is merely to lift up, push a little forward, let down and draw back that object. The actual motion of each water particle is therefore a circular motion, and it never moves far from one place. Each water particle, however, executes the same kind of motion, not all together but successively, and this gives rise to the effect we call a surface water wave.

To produce a wave we must, therefore, have some medium—air, water, or something else in which some change of state can be produced which take place not everywhere at once but successively in time at different adjacent places.

The velocity with which the wave travels can be computed from the properties of the material in which the wave is produced.

There is one special characteristic of a true wave of any kind which must be mentioned here. It is called the interference of waves.

Special Properties

If a set of waves created at some common source is caused to divide itself and travel along two paths of different length to arrive at some point, and if the difference in length of these paths is some odd multiple of half the wavelength—that is, 1, 3, 5, 7, etc., times the half wavelength—then these two sets of waves will annihilate each other, because the crests of one set of waves arrive at the point considered at the instant when the hollows of the other set arrive. Such an experiment can be shown not only with waves of air or sound waves but also with light. Whenever we can in this way produce interference we are unquestionably concerned with a wave motion or wave of some kind.

The very great velocity of light shows that no ordinary material can be the medium in which the waves are created. Moreover, light can be propagated through a space called a high vacuum, in which no material substance exists at all. Hence in the early part of the last century it was found necessary to make the assumption that space is filled with a non-material substance called *ether*, in which waves can be produced.

The next question was the determination of the nature of these ether waves.

Defining Wavelength and Frequency

In the case of sound waves in air or surface waves on water the waves are waves of mechanical displacement. That means the air particles move slightly to and fro along the line of propagation, or the water particles move round and round in circles. It is necessary then to distinguish carefully between the motion of the air or water particle and the motion of the wave.

The speed of the wave is the rate at which the displacement of the particles is transmitted. There are two terms or words we shall have to use often which must be carefully defined.

By the term *wavelength* we mean the shortest distance from hump to hump of the wave or places of greatest compressions. The term *frequency* means the number of oscillations or movements to and fro of the particles at any one place per second.

In all cases of wave motion there is a simple relation between wave velocity, wavelength, and frequency, as follows:—

Wave velocity is numerically equal to the product of wavelength and frequency. Thus, for instance, the note we call the middle C on a piano is produced by 256 vibrations of the air particles per second. But the velocity of an air wave is 1,100 feet per second. Hence it is clear the wavelength of that note is rather more than four feet. The air waves which produce musical sounds vary from a few inches to several feet in wavelength.

Returning, then, to the consideration of the nature of ether waves, the philosophers of the nineteenth century were mostly convinced that these waves were waves of mechanical displacement, and they devoted much thought to the invention of imaginary structures for the ether which would explain the known phenomena of optics.

An Important Suggestion

Then at about 1865 came an important suggestion from James Clerk Maxwell, which indicated that these ether waves which effect our eyes as light are probably not waves of mechanical displacement or motions of the ether but something quite different.

When we rub a stick of sealing-wax or an ebonite penholder on a piece of cloth or flannel we know that it acquires the power of attracting little scraps of paper or feathers or light objects, and is said to be electrified.

The space round the stick of wax or ebonite is said to be a region in which there is electric force.

Maxwell's important suggestion was, that when an electric force is created at one place it is not immediately created at all points of space, but is propagated outwards with the speed of light, viz., 186,000 miles a second.

This led Maxwell to the idea that what we call a ray of light is only a wave of electric force, the force being directed at right angles to the direction of the ray, and pulsatory in character that is varying in magnitude.

Now we cannot form any idea of a mechanical kind as to the nature of this so-called electric force.

We have to accept it as the name for an ultimate reality of nature.

Visible Light

We can only clearly picture to ourselves in our minds motions or changes in position of material substances of some kind, but here we have to deal with a conception which is not necessarily resolvable into motions or displacements at all of any material.

A ray of light is, then, a vibration of electric force in space.

The remarkable fact is, that only a rather narrow range of frequency of these electric vibrations can affect our eyes as light.

The wavelengths of this visible light only extend over a range of one octave—that is from about 1/40,000th of an inch to about 1/70,000th of an inch—and since the velocity of a light wave is nearly 1,000 million feet a second, or 12,000 million inches, it follows from the rule above given that the rates of vibration of visible light extend from about 400 billion to 700 billion.

It is marvellous to think that when we look at a red geranium leaf or rose, something at the back of our eyes vibrates with this enormous speed.

It was mentioned just now that the human eye is sensitive as light only to ethereal vibrations lying within the range of a single octave of vibration, that means within the limits of a ratio of 1 to 2 as regards frequency.

But, now, this does not by any means exhaust the possible range of ethereal vibrations.

An engineer of the Baird Company making preliminary tests in Berlin for the large screen demonstrations at the Scala.

Further Ethereal Vibrations

Ordinary white light consists of a series of very irregular electric vibrations, but if we pass the ray through a glass prism, then the prism separates out the irregular vibration into a series of vibrations of closely adjacent but different wavelengths. Each of these produces a different colour sensation in the retina of the eye, and we call this rainbow-coloured band a continuous spectrum.

The vibrations of about 400 billion frequency produce the sensation of red, and those of a frequency about 750 billion the sensation of violet.

The point next to notice is that beyond the red end of the spectrum there are a set of vibrations which cannot affect the eye, but have certain properties which enable them to be detected by certain instruments.

These ultra-red rays are called dark heat radiation, because, though not visible, they can be felt and

detected as heat. Thus in a dark room if you hold your hand near to but not touching a radiator or kettle of hot water you will feel a sensation of heat. Using the language of music we can say that there are nine or ten octaves of these dark heat rays.

Then beyond these are the radiations which cannot be felt or detected as heat, but which are called the Hertzian waves. There are about twelve octaves of these. Beyond these limits are the long electric waves used on wireless telegraphy, extending in wavelength from about 30 feet to 10 or 15 miles.

Similarly, beyond the violet-end of the spectrum, there is a vast range of wavelengths which do not affect the eye.

Invisible Radiation

Immediately beyond the violet end there are two octaves of invisible radiation called the actinic rays, because they can affect a photographic plate. Most of the radiation by which a photograph is taken is not eye-affecting, but impresses a chemical change on the sensitive film or plate.

Still shorter in wavelength and beyond the actinic rays are the so-called X-rays or Röntgen rays.

These are produced when a stream of particles of electricity, called electrons (of which we shall speak more presently), are allowed to strike against a metal plate contained in a glass bulb, which is exhausted of its air and called a Röntgen tube or X-ray bulb.

Then beyond the X-rays there are vibrations of still higher frequency or shorter wavelength, called the Gamma rays, and these are created or emitted by that remarkable substance, radium, and other similar bodies.

Then again, still beyond the Gamma rays, and still shorter in wavelength, are the so-called Cosmic rays. All these rays, from the longest wireless waves down to the shortest Cosmic rays, are essentially of the same nature as visible light, and they all travel with the same speed through space and have very similar properties. They extend over a range of about 60 to 70 octaves.

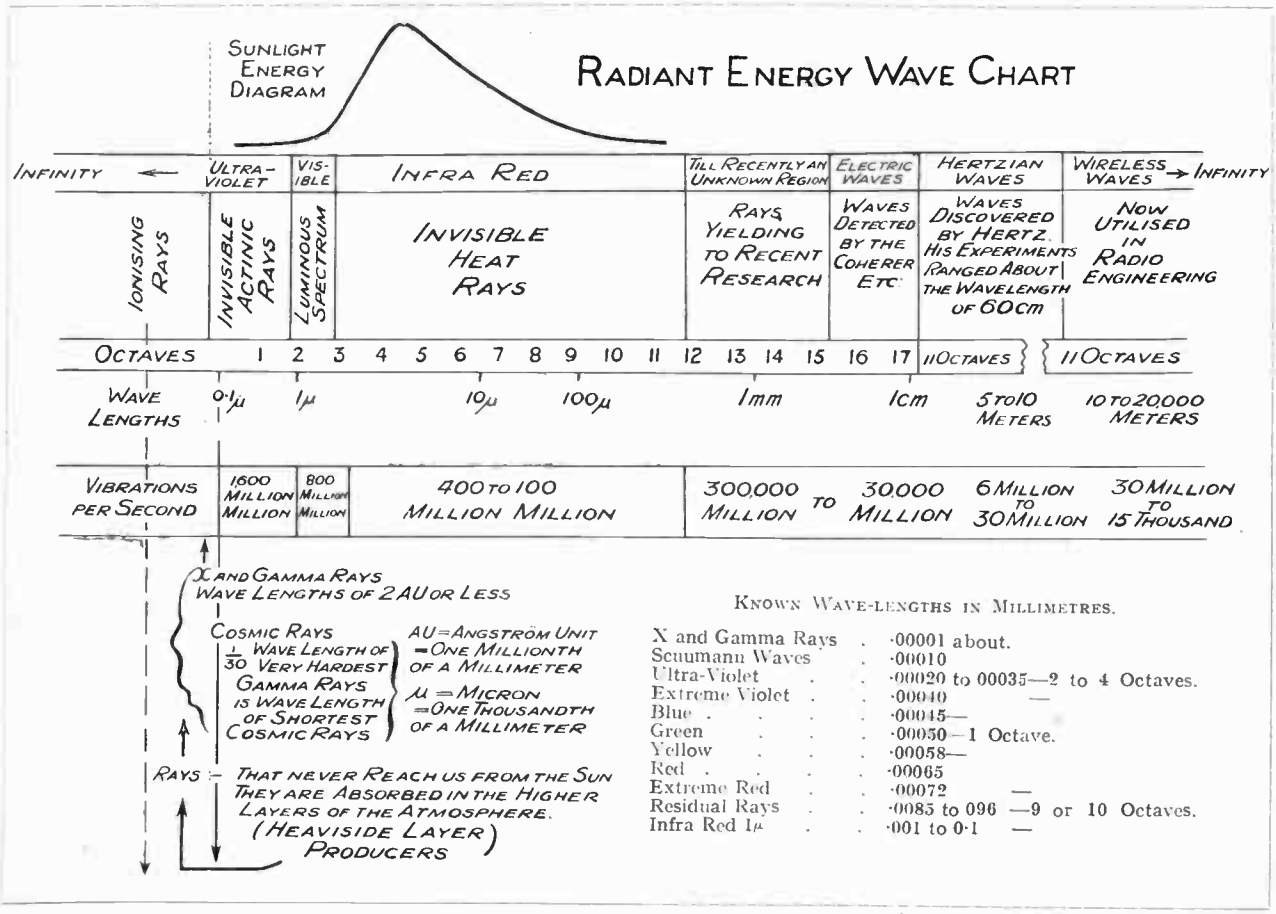
To understand the mode by which these Cosmic rays are created it is necessary to make a little digression, and mention a few of the facts connected with the structure of matter.

A Digression

All the infinite variety of substances with which we are acquainted are built up of little masses called molecules which are similar to each other. All molecules are built up of little groups of a certain number of atoms, and there are only ninety different kinds of atoms.

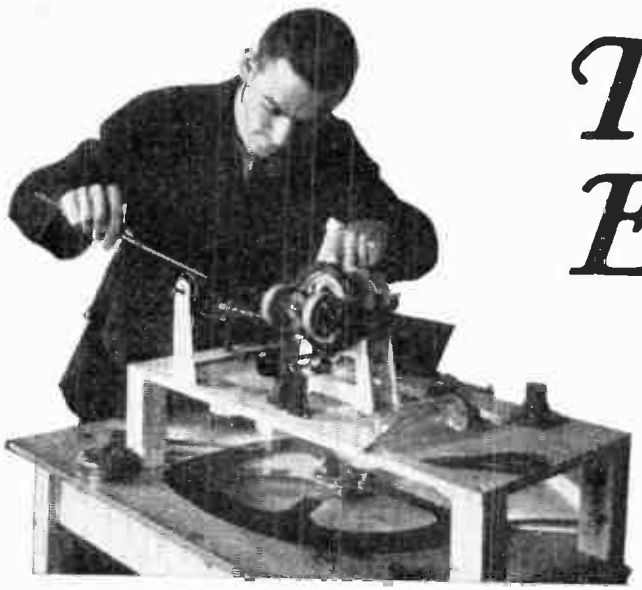
Just as all words are made of letter groups of some of the twenty-six letters of the alphabet, so any kind of molecule is a sort of word built up of a group of atoms as letters.

(To be continued.)



KNOWN WAVE-LENGTHS IN MILLIMETRES.

X and Gamma Rays	·00001 about.	
Schumann Waves	·00010	
Ultra-Violet	·00020 to 00035	—2 to 4 Octaves.
Extreme Violet	·00040	—
Blue	·00045	—
Green	·00050	—1 Octave.
Yellow	·00058	—
Red	·00065	
Extreme Red	·00072	—
Residual Rays	·0085 to 096	—9 or 10 Octaves.
Infra Red 1μ	·001 to 0·1	—



The Enthusiast Sees it Through

"KEEP pegging away for longer hours of transmission" seems to be the keynote of the largest percentage of correspondence which reaches our offices from those enthusiasts who keep in constant personal touch with our magazine. We can assure them that this is one of our greatest activities, and it is to be hoped that in the near future the results will show a materialistic return.

We should like to point out, however, that in the very near future the Baird Company will have on the air their own experimental station, which is to be situated in North-west London. Through the medium of these transmissions, on wavelengths of approximately 50 and 150 metres, anyone possessing vision apparatus will be able to tune in the signals during parts of the day which are more suitable than at present. Complete details regarding this station are not yet available, but undoubtedly once on the air it will relieve the situation considerably.

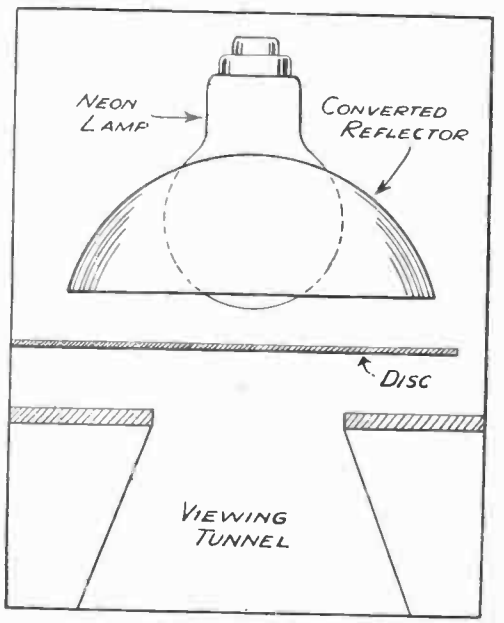
From a Subscriber since No. 1

Mr. F. F. Bowling, of Stainforth, Doncaster, has been a reader of TELEVISION since No. 1, and, as the letter below shows, he has made up his own vision apparatus and is able to get very good results. Like all keen experimenters, he is not satisfied, and hopes to make improvements during the course of the coming winter months. We wish him every success in his efforts, and have no doubt that they will prove encouraging.

"I have been a reader of your publication since No. 1, and am writing to tell you how much I appreciate the information obtainable from its pages, and also to congratulate you on the stand you are taking in your fight for television. I have a home-made 'Televisor,' from which I obtain fair results, working off a S.G. Det. 2 L.F. (trans. coupled) receiver, last valve old L.S.5, supplied with 250 volts to anode, neon direct in plate circuit.

"The vision apparatus itself is made from an old G.E.C. fan motor and base, 20-inch disc of 28-gauge aluminium, cut away as much as possible to give further lightness, square holes to measurements as given by one of your contributors. I rewound an old resistance on slate to get the speed near working conditions, but at present have no synchronising device, but rely on finger braking to phase and hold the picture, and I have become quite expert at this. The mains are very steady here late at night, and once the motor gets warmed up, can sometimes trust the disc to keep in step while making small adjustments.

"I am using an Osglim Beehive pattern neon, with an old lamp lens as diffuser, and this works very well.



Showing how the Neon is arranged in conjunction with a reflector for watching the images.

I can get fair results either day or night, but have not yet been able to bring out much detail. I can recognise most articles, and read the lettering which

passes before the screen, but up to the present I cannot get that little bit of extra detail which puts the gleam in the eye of the artist; possibly it is the use of transformers in the low-frequency part of my receiver.

"Now that winter nights are coming further experiments may give improvement. Keep pegging away for longer and less unearthly hours of transmission, and television is bound to come; but the present hours are rather a trial; many a time during my first tests I have just got going to be in time to see the end.

"May I say that I like TELEVISION very much in its present form, with the exception of the cover; the old one looked better, even if it was a little previous.

"Please give us articles discussing the various faults and difficulties likely to be encountered, and the remedies to be applied."

Results from Folkestone

That it is not always necessary to have a super-type receiver for the reception of television signals is borne out by the contribution to these columns made by Mr. Gordon E. Carden, of 13, Athelstan Road, Folkestone. He has been good enough to furnish us with very complete details of both his set and vision apparatus, and we congratulate him on his achievements. Like most others, he adds a plea for further broadcasting facilities. Extracts from his letter are given below:—

"I have not written to you before about my television apparatus, so you will, probably, be interested in a description of same.

"Accumulators form my current supply. H.T., 150 volts; L.T., 10 volts. The motor takes 10 volts for drive, so I tap this at 2 volts for valves. These are not of the expensive kind, namely: S.G. (7s. 6d.), Det. (5s. 6d.), L.F. (7s. 6d.), Power (9s. 6d.). You will notice from the circuit diagram that all valves have a common H.T.+150 volt (separate S.G. tapping at 100 volts). My receiver, therefore, is not of the 'super' type.

"The vision attachment is as follows:—

"*Motor.*—6–8 volt Lucas dynamo, with 10 ohm Rheostat in series and three 30 ohm Rheostats in series with field coil, two of these being for fine adjustment. This 'motor' runs very steadily. (Staggered armature and ball-bearings.) I obtained this second-hand for £1.

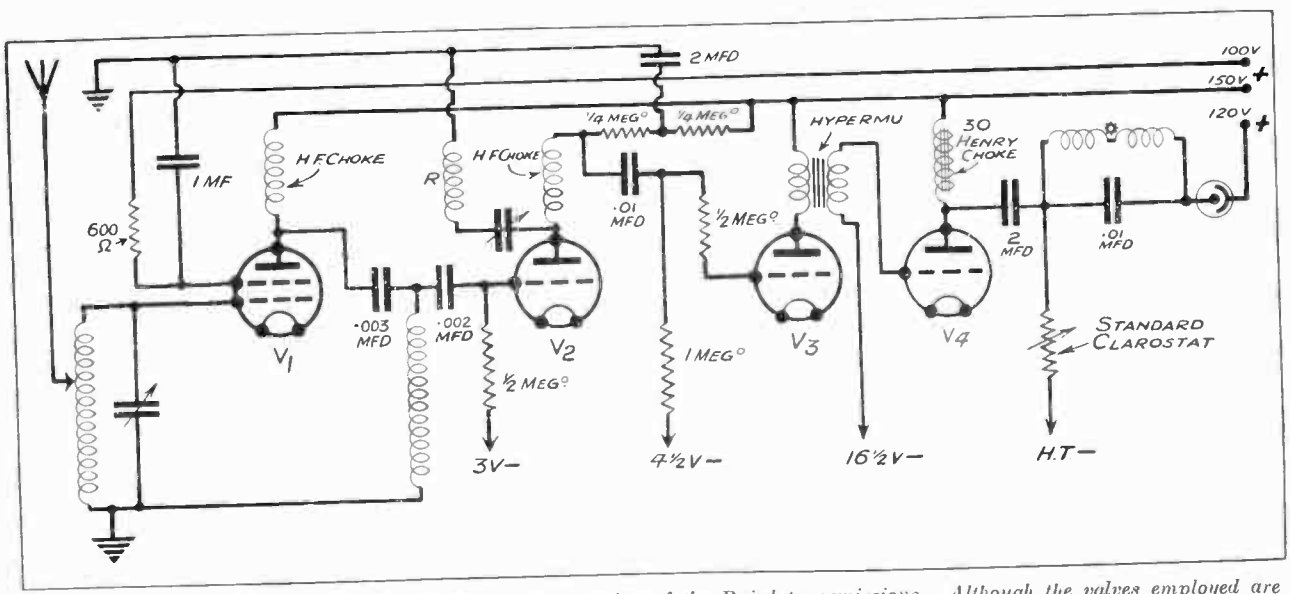
"*Disc.*—Thin Bristol board, the periphery being painted each side with vegetable black mixed with lubricating oil. (I found that other painting methods buckled the paper.) The thirty square holes were punched before painting, these being cleared with the punch afterwards.

"*Synchronising Gear.*—Wheel 3 in. dia., $\frac{7}{16}$ in. boiler plate, coils as per Mr. Waters' article; field ring, 6 in. cast-iron drainpipe.

"*Neon.*—Philips' 110 volt frosted, with reflector as in diagram. I found that this lamp operated far better than 220 type.

"Results from this apparatus are very good. Movements of artistes, marionettes, etc., come over well; words on cards also sharp and well defined. My only complaint is the short programmes. I think it would give amateurs greater scope for improvement if the morning transmissions were cut down to two half-hours, and the evening ones increased to one hour each commencing, say, at 11.30 p.m. I must apologise for taking up your valuable time, but I felt that my good results, with cheap materials, would show what the ordinary experimenter can do much with simple gear.

"Wishing TELEVISION continued success in its endeavours."

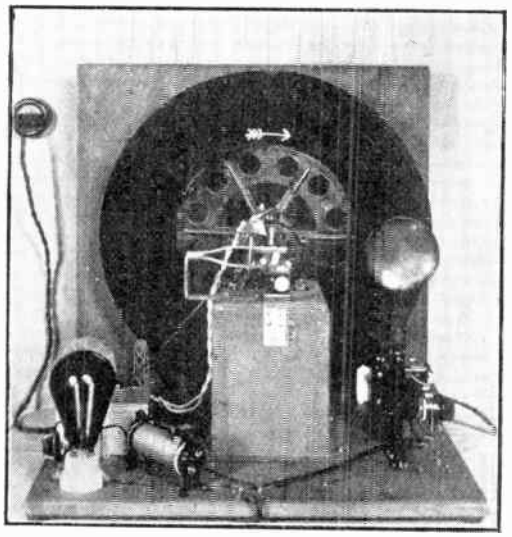


The circuit used by Mr Gordon E. Carden for the reception of the Baird transmissions. Although the valves employed are not of the expensive kind, good results are claimed.

Efforts in France

That the vision signals broadcast from the Brookman's Park Station are received successfully in France is borne out by the communication we have received from Mr. Godefroy, of 48, Rue Ernest Renan, Le Havre. We appreciate his plea for better and longer hours of transmission, and would refer him to the remarks in our opening paragraph. He says :—

"Being a subscriber to TELEVISION and a possessor of a Baird 'Televisor,' I am very pleased to tell you that my experiences have been very successful. I have obtained some splendid results.

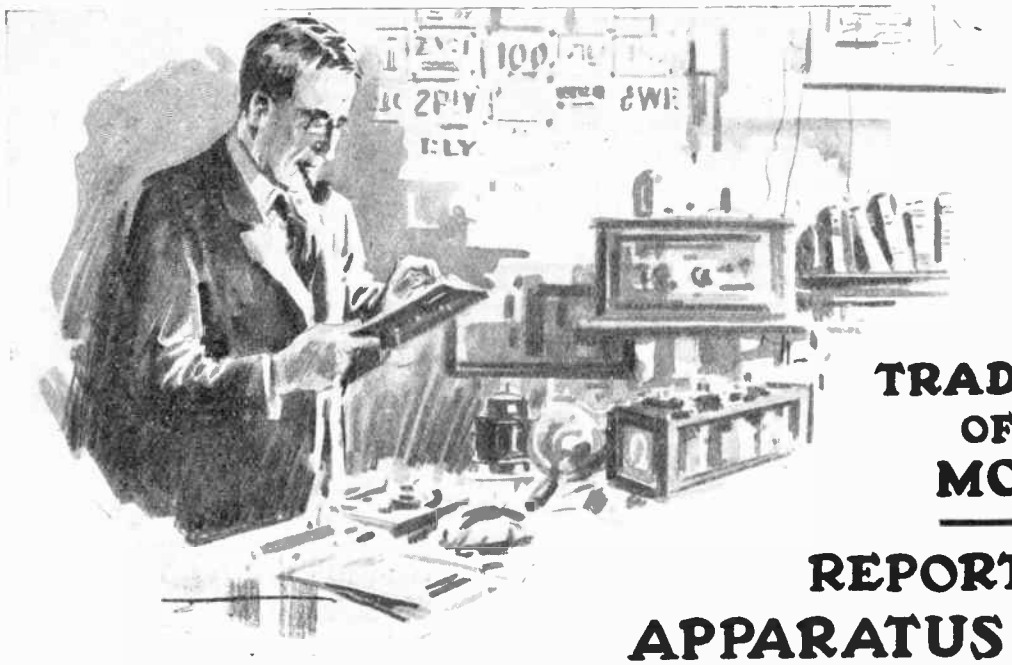


The vision apparatus used by Mr. Josef Häring, of München Very good images have been seen with it.

"However, it is very unfortunate that the transmissions are at 11 o'clock in the morning and at midnight. At 11 o'clock the normal day's business is not finished, while midnight is certainly much too late.

"I think that a good many television lovers must be of the same mind as myself, because it is quite impossible to undertake good demonstrations at those hours.

"It would be ever so much better if the transmissions could take place, say, at about 7 p.m., when all lovers of television could carry out their experiments."



TRADE NOTES OF THE MONTH

REPORTS ON APPARATUS TESTED

IN introducing this link with the trade as a regular feature we feel that we are doing our readers a good service. By testing manufacturers' apparatus, and giving the results of these tests each month, we shall place valuable information in the hands of readers, which will assist them in making their purchases. Furthermore, there are certain trade circulars and catalogues which we know will make interesting reading to all followers of television, as well as many other items connected with the trade which we shall make it our business to deal with.

Naturally, the co-operation of manufacturers is sought in our aim to keep this feature up-to-date, and literature, apparatus for test and review, etc., should be sent to our editorial offices as soon as possible.

A Clever Panel Development

The trend of modern design in wireless receivers is to increase the efficiency and overall stage gain. This is likely to lead to difficulty unless adequate screening precautions are taken, so that the tuned circuits can be "isolated" and made stable in operation. This process of screening is sometimes difficult when it comes to the panel, and anyone desiring an ebonite or composition panel at the front of his set must include a further metal screen at the back of this panel.

Messrs. Redfern's Rubber Works, Ltd., have brought forward a most ingenious solution to meet these cases. Their well-known "Ebonart" panels can now be had metal-backed, and in the sample we have tested the scheme proved most effective. The metal is actually sprayed on by a patent process, so that metal and "Ebonart" are one. Drilling is, therefore, a simple process, and there is no question of clamping two panels of different material together. We are convinced that the idea should make a wide appeal, the small extra cost of the panel being more than outweighed by the extreme convenience of working. Various metal backings can be secured according to requirements.

Catalogues

Well-produced literature always makes an appeal to the keen experimenter, and we have recently had an opportunity of examining catalogues from the Marconiphone Company, Ltd., who state that readers can obtain copies from any Marconiphone appointed dealers, the Dubilier Condenser Co. (1925), Ltd., of Victoria Road, W.3, and Messrs. Claude Lyons, Ltd., 76, Oldhall Street, Liverpool.

In the case of Dubiliers, full information is given concerning their mains receivers, condensers, etc., while Claude Lyons lay particular stress on the fact that the "ClarOstat" solves every resistance problem.

We have had an opportunity of examining "The Book of the M–L Rotary Transformer," issued by the M–L Magneto Syndicate, Ltd., of Victoria Works, Coventry.

A glance through the pages indicated that rotary transformers are now available which will take current from D.C. supplies of any voltage, and will give an output of D.C. at a higher voltage or give an A.C. at 230 volts, 50 cycles.

By the use of one of these machines it is therefore possible to obtain an anode supply of any voltage for a radio receiver or power amplifier, or the use of an A.C. All-Electric Receiver is possible when only D.C. is available.

Such machines, therefore, have a wide application in country districts for use on 32, 50 or 100 volt plant, on ships where D.C. is always available, and, of course, in any towns where D.C. mains exist.

It will be seen, therefore, that these machines are particularly well adapted for television purposes, and we can recommend them with every confidence to our readers.

A Vest-Pocket Detectoscope

We have had an opportunity of testing the Nivex Vest-Pocket Detectoscope, which consists simply of a small neon tube shrouded in an insulating body, and is similar in size to an ordinary fountain pen. Two rather heavy insulating test prods project from one end and terminate in brass tips, this being clearly shown in the accompanying illustration. For rapid tests of electrical circuits and kindred apparatus we found it particularly useful. Some of the capacities in which the Detectoscope finds application are as follows: Continuity indicator, locating blown fuses,

The Nivex Detectoscope is only 4½ ins. long and conveniently clips into the vest-pocket when not in use.

testing transformers, indicating whether A.C. or D.C., locating earths, etc.

The construction is particularly good, it being possible to bend the prods for testing purposes without danger of their breaking. The Detectoscope clips into the pocket just like an ordinary fountain pen, being no larger in size. We can recommend this instrument to our readers.

Microscopic Pencils

There are many tasks undertaken by the experimenter in which some measure of magnification is essential in order to ascertain intimate detail which normally is not revealed to the naked eye. For examining small work, we have found the Microscopic Pencils of V. Naudeau, Ltd., of great advantage. There are two types, known as X20 and X40 to 60.

About five inches long and tubular in shape, they are veritable instruments of precision in every sense of the word. A small mirror let in at the base should be turned towards the light, and with the "pencil" in contact with the small area to be magnified, focussing is effected by raising or lowering a minute lens. The magnification is really considerable, and these pencils should form a very useful adjunct to the experimenter's kit.

A New Super-power Valve

We have had sent to us by the North London Valve Company, Limited, a super-power valve called "Leo the Lion," of very original construction. It can, perhaps, be best described as consisting of four sets of electrodes internally connected in parallel but with a common anode. This anode is divided into two compartments, however, and in each is assembled two grids and two filaments.

We understand that the required hard vacuum of this valve is obtained by pumping over a very long period, and it has to pass stringent final tests before leaving the works. With an overall height of 8¼ inches, the glass envelope is 6 inches high and 3 inches in diameter. The normal working potential is 400 volts, and when tested at this voltage is rated to give 114 milliamps. with a negative grid bias of 80. We are testing this valve and will give a full report in next month's issue.

Forthcoming Lectures.

The following is a list of some of the Lectures for November to be given by Mr. J. J. DENTON, A.M.I.E.E., Joint Hon. Secretary, Television Society. Readers interested may obtain tickets of admission by applying to Mr. Denton, Television Society, 4, Duke Street, Adelphi, W.C. 2.

NOV. 6TH.—Thursday: Derby Wireless Club. 7.30 p.m.

NOV. 8TH.—Saturday: The Schools, Shrewsbury. 5.30 p.m.

NOV. 17TH.—Monday: Institute Electrical Engineers, Liverpool. Mersey and North Wales (Liverpool) Centre.

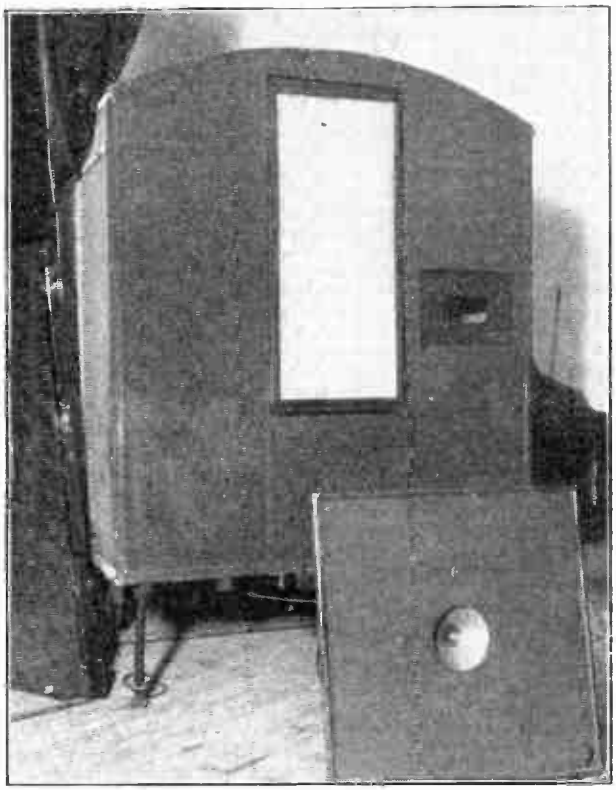
NOV. 25TH.—Tuesday: Engineering and Draughtsmen Association, Lincoln. 7.30 p.m.

NOV. 26TH.—Wednesday: Engineering and Draughtsmen Association, Newark. 7.30 p.m.

NOV. 27TH.—Thursday: Engineering and Draughtsmen Association. Nottingham. 7.30 p.m.

Working the Large Screen in Berlin

By G. B. Banks, B.Sc.



The "caravan" with the large screen set in place and the "observation" aperture on the right. In the foreground is one of the loud speakers.

FOLLOWING on the success of the demonstrations of screen television at the London Coliseum, interest was aroused all over Europe, and the Baird Company received numerous invitations to install their apparatus in the most important continental cities.

Consequently an expedition, consisting of four engineers and a large quantity of apparatus, set out for Berlin. Arrived there at the Scala Theatre we received our first shock! The van containing the television screen and apparatus was too big to pass through the stage entrance!

A brief consultation was held with the stage hands, and a squad of enthusiasts started to demolish a foot of brickwork from the wall, and in a very short time the van was on the stage.

The Second Shock

True television never runs smoothly, however, and shock number two soon came along. We had been informed in London that the power supply at the Scala Theatre was A.C. at 200 volts and D.C. at 200 volts, and had prepared our apparatus accordingly. Lo and behold, no sooner did we investigate than we discovered that direct current was conspicuous by its absence, and that the only power obtainable was A.C. at 125 volts.

This was terrible. Fortunately we were able to obtain a large motor generator at short notice, which supplied us with D.C. at 200 volts. A subsidiary motor generator was run from this, giving us A.C. at 200.

A Miniature Lotts Road

The reader will appreciate the complications involved with this power supply. For every performance it was necessary to start up a miniature "Lotts Road," in addition to the normal tasks attached to the television van—and all in a few minutes, while the interval was on. Happily every performance went off without a hitch, and the picture was always ready for the rise of the curtain.

In the meantime a studio had been fixed up in the Friedrichstrasse, and standard Baird transmitting gear installed. The apparatus was in no way different from that used for the Coliseum demonstration (see TELEVISION, September, 1930), and was in working order within two days of its arrival in Berlin.

Overcoming Difficulties

The first test was undertaken on the Saturday previous to the Monday on which we were due to start, and it was then that we received our third and last setback. The pictures received at the Scala Theatre were weak and below standard. A portable television receiver was rushed to the studio, and we looked at the picture as it left on its way to the Scala. It was perfectly normal.

The only explanation was that distortion was taking place in the lines between the studio and the Scala. Now these were only supposed to be 2 to 3 kilometres in length, and very little attenuation was expected. Inquiries sent to the post office authorities elicited the information that the lines were *over* 10 *kilometres* in length.

* * * *

A glimpse into the studio which was located in the Friedrichstrasse, Berlin. One of the Artists is shown seated while telephonic communication is being maintained with the stage at the Scala. Note Mr. Baird's photograph at the bottom of the picture.

* * * *

Huge Success

More rush work. Extra stages of amplification were rigged up in conjunction with an elaborate system of line correction, and after numerous adjustments we were delighted to see the picture becoming clearer and yet clearer, until it was considerably *above* the standard achieved at the Coliseum, where the line was only 400 yards long.

This was the end of our tribulations, and we all breathed sighs of relief.

The demonstrations were given twice daily for a fortnight, and very attractive programmes were arranged featuring many famous German citizens, as has been described by Mr. Moseley in this issue. The exhibition was very enthusiastically received by the German public, and all the press commented very favourably on the large screen—a British invention.

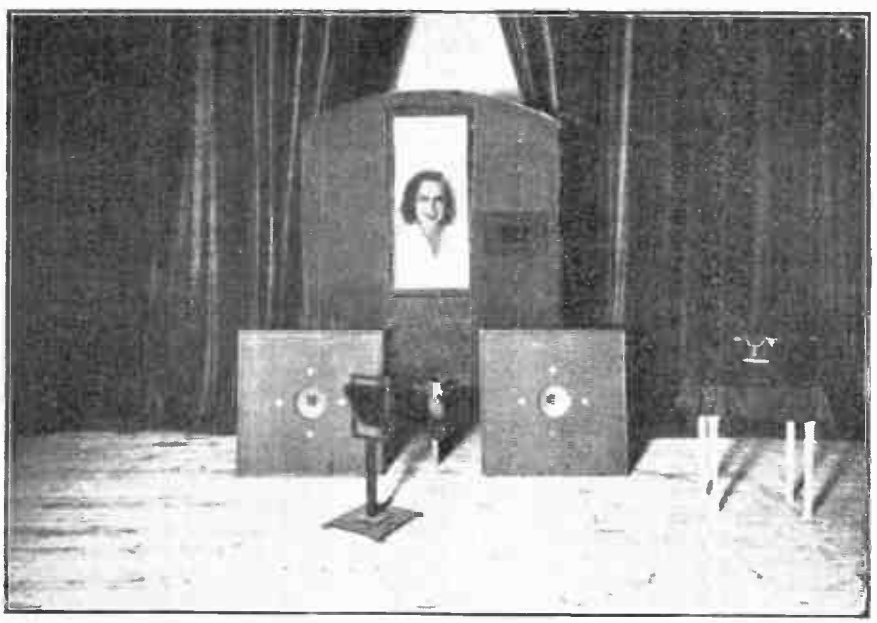
The following short extracts from German newspapers tell their own story :—

Berliner Lokalanzeiger.—" Gigantic and endless possibility, astounding achievement. Epoch making, remarkable."

Uhrblatt.—" Magnificent invention. Baird's photo received tumultuous applause."

Berlin am Morgen.—One holds one's breath."

Vorwärts.—" The miracle has happened. Perfectly synchronized."



* * * *

The screen was set well back on the Scala stage, which was draped in black. The face shown on the screen has been included to give an impression of what the image actually looked like to the audience, it being remembered that the screen size was 5 ft. by 2 ft.

* * * *

An Ingenious "Teletester"

DESIGNED AND DESCRIBED BY

H. J. Barton Chapple,

Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

MY electrical and wireless experience has extended over a period of many years, and the more one becomes acquainted with the experimental or practical side of radio the greater becomes the realisation that methods of sheer trial and error contribute nothing towards advancement. This is doubly emphasised in the case of television, for here we are delving into something which is almost a virgin field.

Except for TELEVISION and one or two books there is really little information to guide the enthusiast, and in many cases he is thrown on his own resources when endeavouring to fathom the cause of some phenomena.

Using the Eyes

No doctor or physician could diagnose the troubles of his patients without his case of instruments, so why should the radio man, who regards his wireless receiver as something more than a piece of furniture, be expected to achieve first-class performance with his set, or alternatively rectify any defects that may arise, without using his eyes. In just the same way as television is beginning to educate the public to the belief that the sense of sight is essential either for entertainment or utilitarian purposes, so it becomes appropriate that the columns of this journal should emphasise the importance of sight in connection with the efficient working of the vision wireless receiver.

The ear will assist in telling you the condition of the receiver and its auxiliary apparatus, but only in a small proportion when compared with the valuable data which can be acquired by the use of the eyes to read measuring instruments.

Cause and Effect

This point has been brought home to me very forcibly since I took up the study of television, and it soon became apparent that some form of tester was desirable in order to carry out investigations with any degree of efficiency and accuracy. The wish was father to the thought, and I resolved to build for myself a piece of apparatus which would meet most of my needs. The result is the "Teletester," and many hours of experiment were spent before the final design was decided upon.

Frankly, I have found the "Teletester" of inestimable value, and I can assure all readers who decide to build one for themselves that they will at no time regret the decision. It is almost impossible to indicate every one of the uses to which this unit

The complete "Teletester" in its compact box with the accessories mounted in the lid. The testing handles are shown at the side.

can be placed, that only comes with actual experience, but I know that once you appreciate its benefits it will become your constant companion.

All to Hand

An instrument box of this nature is far superior to a collection of apparatus individually suited to specific purposes, for you will find that the "Teletester" not only enables you to measure currents and voltages external to your set, but also reveals to you the conditions of your valves, etc., inside the set while actually in operation and handling the wireless signals. This is very important, for it is the working conditions that are really of the greatest significance in your receiver, and since these readings can be secured without disconnecting any wires normally joined to the set, the advantage becomes twofold.

Before dealing with the apparatus itself let me just indicate a *few* of the measurements that can be made with the "Teletester":—

1. L.T. battery voltage.
2. L.T. battery current.
3. H.T. battery voltage.
4. H.T. battery current.
5. Valve plate current.
6. Valve plate voltage.
7. Valve filament voltage.
8. Valve filament current.
9. Grid bias battery voltage.
10. Continuity tests.
11. Characteristic curves.
12. Distortion indicator.

These items have just occurred to me as I write, and by no means exhaust the list of uses. As far as the readings are concerned, these cover the following six ranges:—

1. 7.5 volts.
2. 15.0 volts.
3. 150 volts.
4. 300 volts.
5. 30 milliamperes.
6. 1.5 amperes.

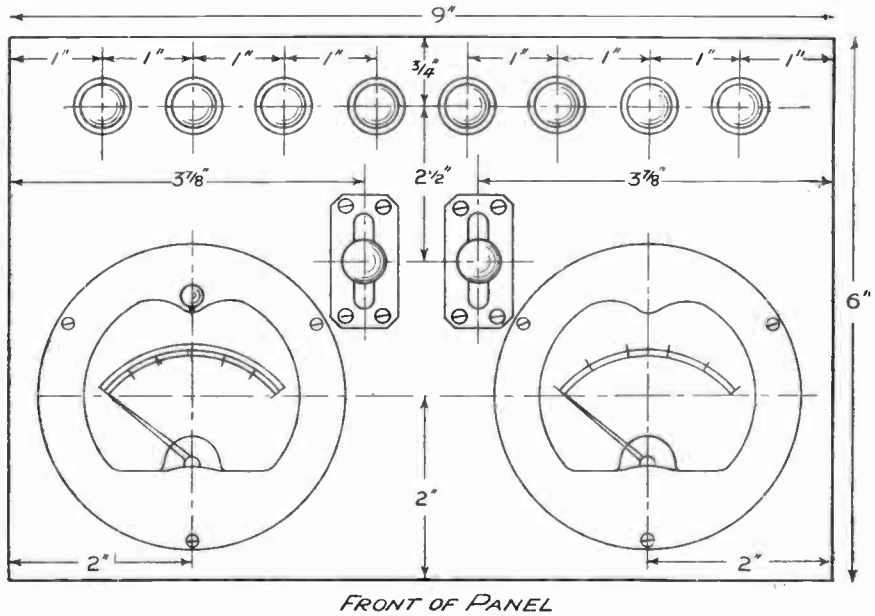


Fig. 1.—Pay careful attention to the details given in this dimensioned panel layout.

Constructing the Unit

Now most constructional articles deal with the theory of the apparatus first and then proceed to describe the details concerned with the making. This policy is an excellent one where, say, wireless receivers are concerned, but with the "Teletester" I propose to reverse the process. In other words, I think the best purposes will be served by describing first of all the actual construction of the unit, and then follow this up with the theoretical considerations and some of the uses.

Our initial task, therefore, is to collect together all the components that will be required. Below I have appended a complete list of the items I used, together with the manufacturers' names. A glance at the accompanying photographs will show that the unit is very compact, and, in consequence, I strongly recommend readers to adhere to the components specified. If desired, Messrs. Peto-Scott Co., Ltd., will supply the complete kit of parts direct.

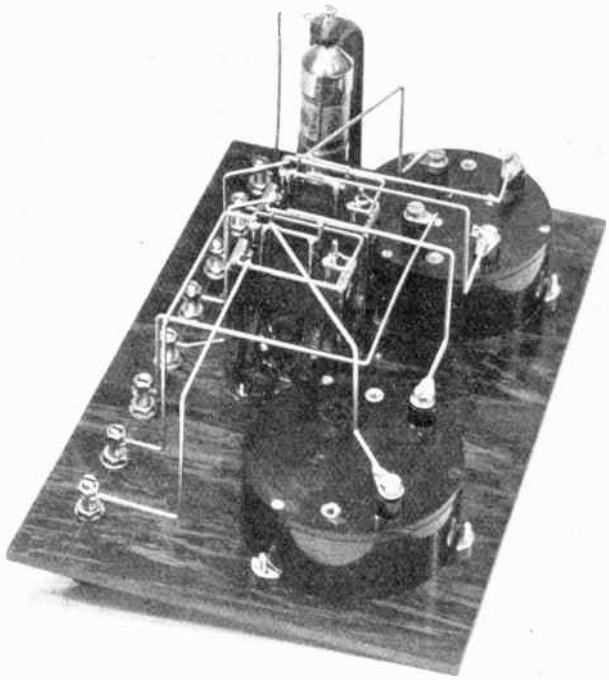
Components required for the "Teletester"

One "Ebonart" panel 9" × 6" × $\frac{3}{16}$". (Redfern's Rubber Works, Ltd.)
Two double pole double throw switches (lever pattern). (Wright & Weaire, Ltd.)
Eight insulated terminals (3 L.T.+, L.T.—, H.T.—, H.T.+, H.T.+1, H.T.+2). (Belling & Lee, Ltd.)
One anti-phonic valveholder. (Whiteley, Boneham and Co., Ltd.)
Two testing handles. (J. J. Eastick & Sons, Ltd.)
Three 1,000 ohm telephone bobbins. (A. F. Bulgin and Co., Ltd.)
One 30,000 ohm wire-wound resistance and holder. (Varley, Ltd.)
One four-way cord. (London Electric Wire Co., Ltd.)
Two gramophone pick-up adaptors. (A. F. Bulgin and Co., Ltd.)
One flush mounting ammeter, 1.5 amp. range. (Ferranti, Ltd.)
One multiple scale flush mounting meter, 150 volts, 7.5 volts, and 30 milliamps ranges. (Ferranti, Ltd.)

One split anode adaptor. (A. F. Bulgin & Co., Ltd.)
One set of Absorbos. (A. J. Stratton & Co., Ltd.)
One special containing box complete with carrying handle and fastener. (W. & T. Lock, Ltd.)
Quantity of red and black flex. (London Electric Wire Co., Ltd.)
Connecting wire. (Junit.)

Drilling Operations

Make a start, first of all, on the panel which can be chosen from the Ebonart range of Redfern's in several different classes of finish. In Fig. 1 you will see all the details given in the form of a fully-dimensioned drawing, and this will be of assistance in enabling you to mark out all the drilling positions. Two $2\frac{7}{8}$ inch diameter holes are needed to accommodate



How the wiring is carried out under the panel is portrayed in this photograph.

the meters, the clearance holes for the small bolts being made after the instruments have been centred carefully. In the case of each lever switch, slots must be cut out to give the lever free movement and the top plate will act as a template to mark out the necessary channels. The screwing into place of the eight insulated terminals is, of course, quite straightforward.

So much for the front of the panel. Now turn the panel over and, with the aid of the accompanying illustrations and Fig. 2, proceed to fix in place the 30,000-ohm resistance and holder and also the three 1,000-ohm telephone bobbins.

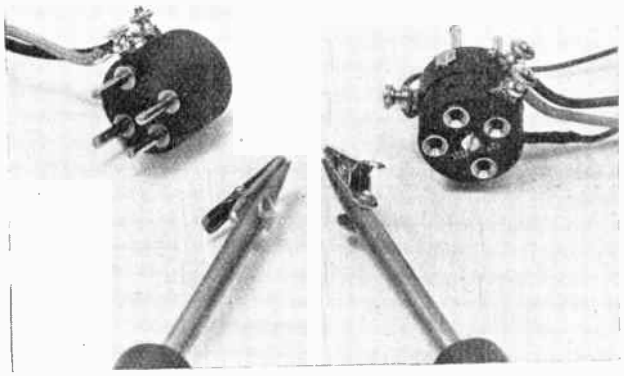
Under the Panel

As will be explained later, the object of including these resistances is to double the two voltage scales of the multiple meter. In the case of the 30,000-ohm

resistance it is quite an easy matter to seat the holder on the underside of the panel and fix it in place with two screws. Take care that the screws do not pass right through the panel and disfigure the front, for the thickness is only $\frac{3}{16}$ inch. With the bobbins it is necessary to arrange these side by side on a thin strip of material—I used thin aluminium—and then hold them against the panel by passing a screw through each end of the strip. This is shown very clearly in Fig. 2.

Arranging the Bobbins

Since it is necessary to convert the three separate resistances into a total resistance of 1,500 ohms, I advise you, first of all, to join up the coils and then screw them into place. This is done by placing two of the bobbins in parallel, giving a combined resistance of 500 ohms, and then place the third bobbin in series with the two, making the combination 1,500 ohms. Fig. 2 indicates how the three coil ends are twisted and soldered together on the right, while a pair of



A view of the "auxiliaries" which are used in conjunction with the instruments mounted on the panel.

the other ends pass to the L.T.+2 terminal and the remaining end to the right-hand switch as shown. Sheathe the wire with insulating sleeving to prevent it becoming damaged.

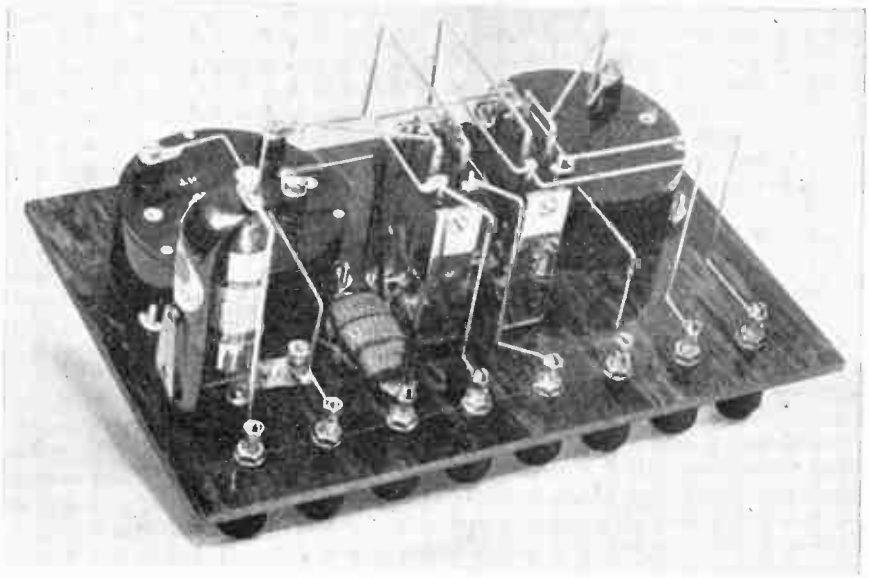
Wiring

All is now plain sailing for the wiring. Carry out this section of the work with extreme care, using both Fig. 2 and the illustrations to guide you. Make the wiring runs as short as possible with neat right-angled bends. To overcome the liability of loose joints I have soldered each connection, but, of course, this is not absolutely essential.

Having checked over your leads to allay any fears of "sins of omission or commission," place the panel into its box so that it rests on the fillets provided. This box was made specially for me by W. & T. Lock, Ltd., and has a lid of two inches inside depth and a leather handle complete for carrying purposes, and is really of first-class workmanship. As a precautionary measure against jolting or hard knocks, I have screwed into place four Absorbos, one at each corner of the underside of the box, and the "rubber feet" in this way protect the instrument and prevent it scratching any wooden surface on which it may happen to be placed.

The "Auxiliaries"

The next item we have to consider is the "auxiliaries" which go to make up the complete "Teletester." First of all, the testing handles. Originally I made these up from ebonite and brass rod with crocodile clips attached to the ends. Should any readers desire, I will describe the construction I adopted, but I have suggested the testing handles, or the spring prodders of Easticks in the components list, as they will serve quite well for the purpose.



Notice how the wiring is carried out in neat, right-angled bends. Pay particular attention to the positioning of the telephone bobbins.

Just fix a length (say six feet) of red and black flex to the handles and terminate each lead in a spade tag so as to make a neat finish. The handles and flex then enable you to make any required measurements, as will be described later.

Now for the split anode adaptor. Here again, the work is simple. We require another length of red and black flex terminating in two spade tags. When joining the red and black leads to the terminals on the adaptor see that the red wire is connected to the terminal which is nearer to the pin. This will ensure that the current is registered in the correct

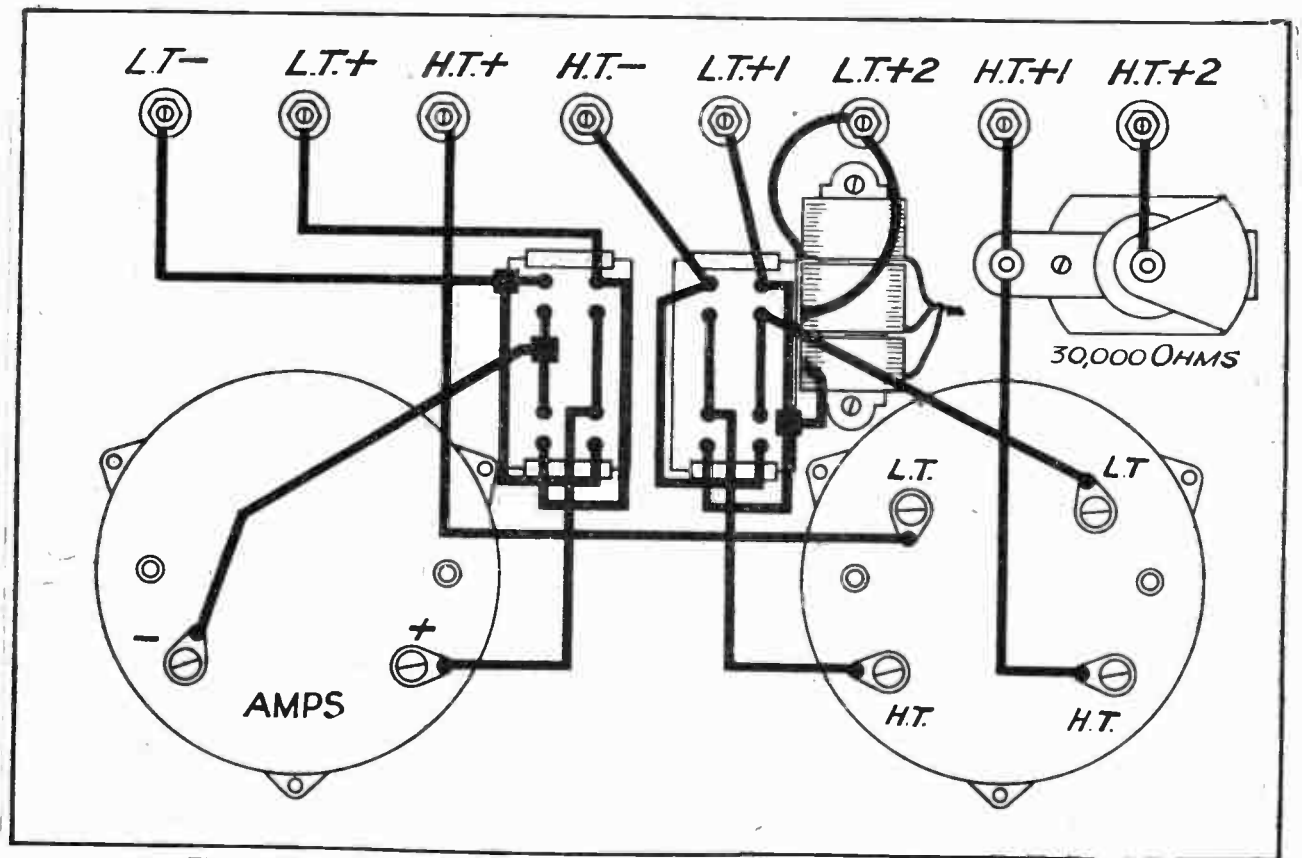


Fig. 2.—The wiring for the "Teletester" is perfectly straightforward and this diagram should be used in conjunction with the photographs.

direction in the milliameter when readings are being taken under working conditions.

Making up the Adaptors

Finally, we come to the special use made of the two gramophone pick-up adaptors, and we must combine them in order to make possible the measurements of filament current, filament voltage, and anode voltage in an ingenious manner. These adaptors are shown in one of the accompanying illustrations and the "amalgamation" is quite straightforward. In the Bulgin pick-up adaptors I have specified you will notice that the split pin of the grid socket is missing.

Now, in our combined plug we want available a plate connection, a filament connection, and the second filament has to be "broken" and have two terminal connections to enable an ammeter to be inserted and the filament current of the valve registered.

Complete Instructions

This is portrayed diagrammatically in Fig. 3A, (*a*), (*b*), (*c*) and (*d*), being the respective terminal points. Take one adaptor, therefore, and completely dismantle it. Remove the grid socket of the other adaptor and replace with a complete pin and socket, holding it in position in the ebonite with a screw since no terminal connection has to be made to it. Now remove the plate socket screw of this same adaptor and replace with a terminal.

I have arranged for the right-hand filament socket to be split. Cut off, therefore, the right-hand filament socket of the adaptor which was not dismantled, so

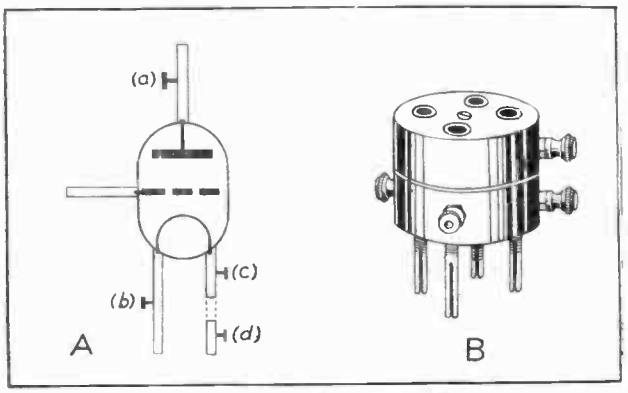


Fig. 3.—Theoretical and pictorial representations of the two pick-up adaptors which have been modified for the "Teletester."

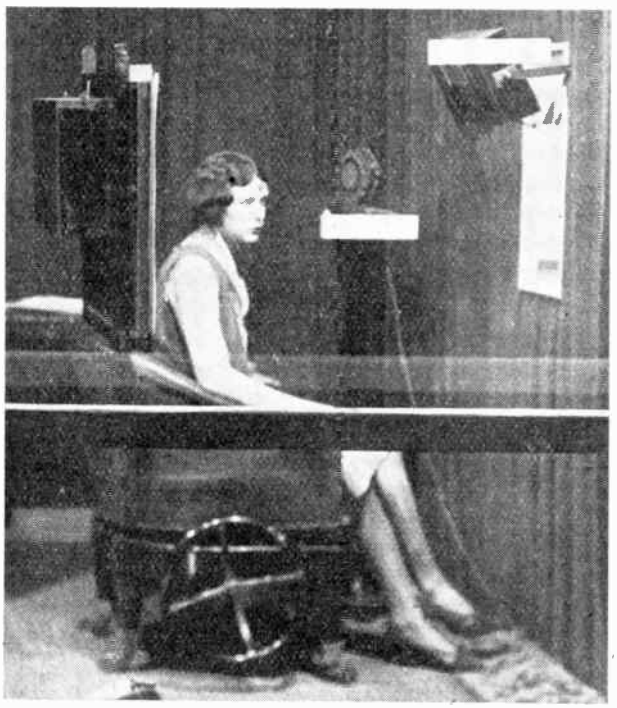
that it is flush with the top of the ebonite. Place one of the original grid sockets, that is one without the split pin, in the right-hand filament hole of the ebonite of the dismantled adaptor and hold it there with a terminal. Now slip this ebonite over the three sockets of the other adaptor and hold the two ebonite

(*Continued on page* 392.)

Studio Topics

I NOT infrequently hear it expressed that the Television Screen News, which is a familiar part of the Baird Television Co.'s daily transmissions, makes a most interesting and instructive addition to these programmes. Originally this particular method of conveying news by printed words presented no little difficulties before it became of real value for transmitting items of news. The new electrical device was first introduced on April 2nd of this year, two days after the inaugural opening of the dual wavelength.

It had been customary up till then to work from a hand-worked apparatus, but this system obviously



The original hand-worked screen news apparatus can be seen fixed to the back of the special chair shown in this studio photograph.

had its drawbacks, because the letters were not interchangeable, the message to be shown being printed on a roll of linen. Consequently the same item of news was continually being projected.

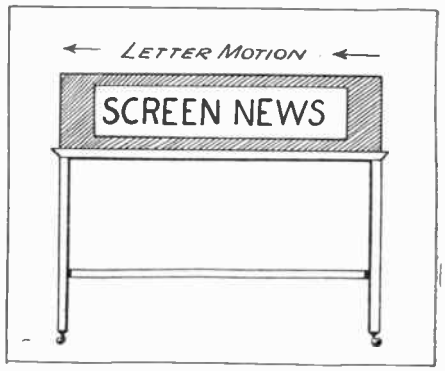
Since the introduction of the new system, however, many improvements have been made, and the shadows that were once a source of trouble have been eliminated.

If readers of these notes will turn to the August edition of this Magazine, they will find on page 251 a sketch of the studio screen. In the centre of this will be seen the aperture behind which the news apparatus is placed. When the announcer is heard to say, "One moment, please, for Television Screen News," the sliding panel, which has previously obscured the aperture, is drawn on one side and the lettering is at once seen to move across the field of vision from right to left. The size of the letters, by the way, is 3 by 2¼ inches, these being the most suitable dimensions for producing the best results.

* * *

Showing how the screen news apparatus is mounted. Notice the direction of the letter movement.

* * *



The interior of the apparatus contains an endless roll of varnished linen, which passes at intervals over rollers, and along which are regularly spaced small slots for the insertion of the letters. It is lined with thick felt to reduce the sound caused by the letters continually passing over the rollers. A general idea of the exterior of the apparatus is shown in the sketch.

The Baird Studio Pianist

Many listeners will, of course, have heard the piano music which accompanies the projection of the Screen News. This is performed by Mr. Cyril Smith, the Baird Studio pianist, whom those with "Televisors" will have seen as well as heard, and who excited the interest of the musical highbrows a short while ago at one of the Queen's Hall Promenade Concerts.

Mr. Smith, who is just twenty-one years of age, was, I believe, interested in music at the tender age of two, though what form it took at that early stage it is impossible to say. When four years old Cyril Smith could read music sufficiently well to enable him to play small pieces, and when twelve months or so later he found it necessary to use the pedals, which he was unable to reach, the difficulty was overcome by securing blocks of wood to them, and during this period he became accompanist to his school choir. It is interesting to note that at the age of twelve he competed against his brother (aged twenty-one) in an open competition. The young musician was first and his brother second!

HAROLD BRADLY.

Watch your Television screen for these artistes during November

1. *Mr. ALFRED CAVE, the young English violinist who studied under the distinguished Professor Leopold Auer. Has played at the Queen's Hall Promenade Concerts, and is familiar as a radio artiste.*
2. *Mr. FREDERICK WEST, tenor, who is familiar to lookers-in at both our morning and evening broadcasts.*
3. *Mr. RICHARD HAWKINS, tenor, whose pleasing voice adds much interest to the television image.*
4. *Miss WYNNE AJELLO, soprano. Has had much microphone experience, to which she is adding a knowledge of "television technique."*
5. *Mr. WILL GARDNER, one of our pioneer entertainers, whose amusing character studies are frequently enjoyed by television enthusiasts.*
6. *Miss COLLEEN CLIFFORD, whose talents receive the scope they deserve through the medium of television. Was known in Australia as the "live-wire girl" (not a trapeze act!).*
7. *Miss ELSIE HULME, a talented young mezzo-soprano, who is a newcomer to our television broadcasts.*
8. *Miss MIRA JOHNSON, a clever artiste who specialises in Lancashire and American character studies.*

Television for the Beginner

PART XI

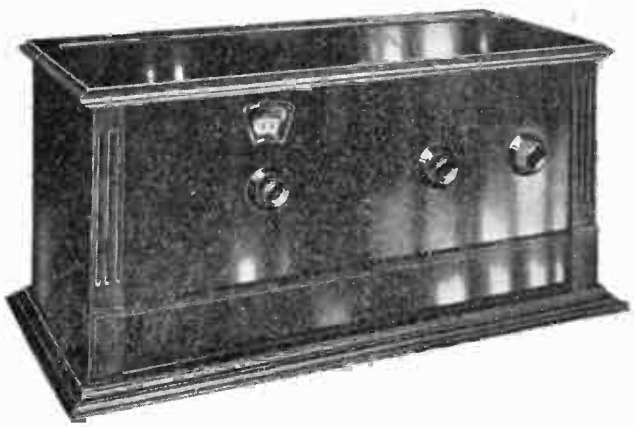
By *John W. Woodford*

IN approaching the question of quality in the vision wireless receiver I am tempted to parody Shakespeare and say "the quality of a wireless receiver is not strained, it cometh as a result of forethought and design."

Living in an age of wireless reception that appeals to the ear, we find that the quality factor appears to vary almost with every individual. Some are contented, perhaps from force of circumstances, to listen to a cheap two-valve set used in conjunction with a horn loudspeaker. They speak in tones of pleasure at the results achieved and for some unaccountable reason regard the tone and quality of a high-class cone or moving-coil loudspeaker in an inferior light.

A Test

Again, if you were to test half a dozen people by letting them listen to half a dozen loudspeakers, it is quite long odds that their aural tastes would differ so widely that the palm of perfection would be awarded to each of the loudspeakers in turn. Test the truth of my remarks amongst your own friends or even put yourself to a trial and I think you will agree with



The receiver employed for handling the vision signals must be of a good quality capable of giving an undistorted output.

me that *quality*, as judged by wireless reception with the ear as the referee, is bound up almost completely with the personal side.

This comment is made in no derogatory fashion but rather as a bold statement of fact arising from the result of a wide experience and acquaintance with broadcasting.

With television, such is not the case. We are not victims of "the quickness of the disc deceiving the

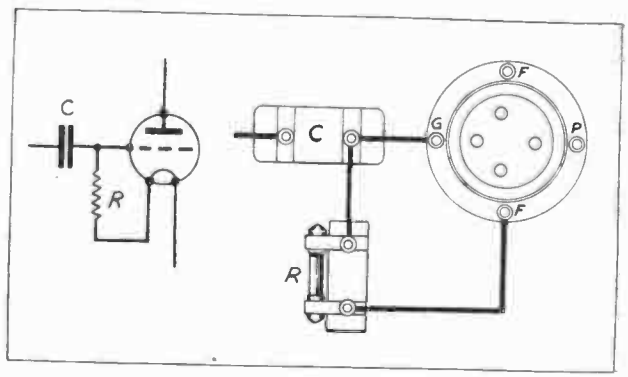


Fig. 1.—Grid leak rectification is shown both theoretically and pictorially in this diagram.

eye." The "Televisor" is an instrument which will reproduce faithfully whatever is put into it and in this respect differs from the many types of loudspeakers, which are capable generally of giving different results even when each is connected to the same wireless receiver. We have analysed the "Televisor" in fair detail now and are fully cognisant with its merits and demerits.

Brief Hints

The quality of our image will now depend upon the way the vision signal input is handled through the various stages before being handed over to the neon lamp with its associated disc. We must therefore pay somewhat more attention to our wireless set for television than we are wont to do for the usual B.B.C. broadcasts. The time will be well spent and will require no deep knowledge of the subject, provided certain facts are accepted by the reader without demanding proof.

By this I mean that in this article, and the final one which is to follow, I cannot hope to give more than a few brief hints and hence long explanations to prove the truth of my theories must be omitted. First of all

let me say a few words concerning the detector or more correctly rectifier stage in your set. Broadly speaking, two methods are in general use, namely (*a*) grid leak and condenser and (*b*) anode bend. The high-frequency oscillations fed either direct from the aerial or from the high-frequency valves pass to this stage for conversion into a *pulsating unidirectional current*. These signals must be handled faithfully and experience no form of distortion at this particular juncture or the effects will evidence themselves when looking at our image.

Detector Differences

The essential differences between these two methods can be summed up quite simply. With anode bend

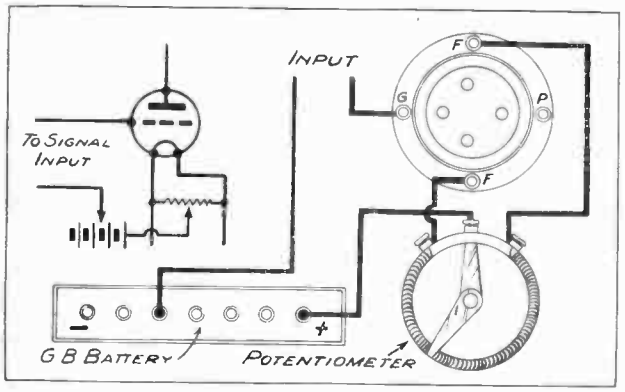


Fig. 2.—Notice the arrangements made for applying the correct grid bias in the case of an anode bend detector.

the high-frequency currents are amplified in the valve first and then rectified in the anode or plate circuit, whereas, with grid leak and condenser, rectification takes place in the grid circuit of the valve and the resulting low-frequency current undergoes magnification in the valve itself.

Taking the latter case we have a fixed condenser of .0002 to .0003 mfd. capacity and a grid leak of one to two megohms joined to the valve as indicated in the theoretical and practical diagram of Figure 1. Suffice to say that this simple but ingenious method of coupling the components together makes the grid voltage vary in accordance with the low frequency portion of the signal. In practice the charges of electricity collected by the fixed condenser reduce the normal grid voltage and the anode current reduces in sympathy.

Anode Bend

If strong signals should be impressed upon the grid, the grid circuit is very liable to choke and distortion will result, but with weak signals this system of rectification is very sensitive and has a wide application in ordinary wireless reception. In addition it should also be noted that the presence of the condenser is likely to give rise to frequency distortion and this is detrimental to our image which relies so much on the higher frequencies for its wealth of detail.

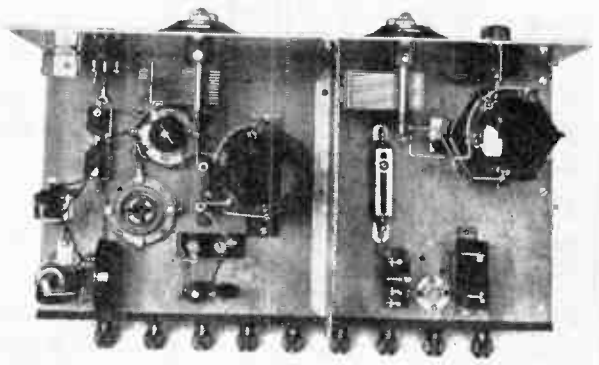
Turn now to anode bend, which is shown theoretically and practically in Figure 2. Here use is made of the actual bottom bend in the valve characteristic and in consequence demands a careful adjustment of grid voltage. This is provided through the medium of a grid bias battery and potentiometer resistance placed across the filament supply.

Since the plate current change resulting from the signal modulation actually takes place on the *straight* part of the valve characteristic, there is direct proportionality between the input and output signals. The only difference lies in increased strength due to valve amplification and in consequence no distortion will arise when the voltage adjustments are carefully predetermined. If the signals are weak then the curved part of the characteristic is brought into play and this proportionality is lost. We see, therefore, that this mode of rectification favours strong signals and furthermore you should note in passing that the mean anode current increases with the impression of the signal.

The Best Choice

Now it is a golden rule with the reception of vision signals that reaction in any form should be eschewed, since it is so liable to bring about distortion. What bearing has this factor upon our choice of the best detector? Well, in the first place, we must have ample signal strength—the quantity factor was dealt with last month—and except in situations very close to the transmitting station, this will mean the employment of at least one stage of high frequency amplification, preferably screened grid.

The signals impressed on the detector stage, therefore, will be of relatively large magnitude and our previous reasoning will show that anode bend detection is thus to be preferred for television working. This fact is borne out in practice and readers will, perhaps, have noticed that the Baird Company



Here we see the high frequency and detector stages of a special unit designed for receiving the vision signals.

themselves recommend all users of their apparatus to employ an anode bend detector stage and I trust I have managed to make the reason sufficiently clear in the preceding short notes.

Now what of the high-frequency side of the receiver? Is this an important criterion of the set or will any modern form of high-frequency amplifier coupling be suited for television purposes?

The High Frequency Side

The first important point to note in this connection is that the tuning circuits must not be too sharp, that is, something of the hyper-selective class, or the high frequencies will suffer by being cut off or reduced considerably. This might appear something of a problem when the latest outcry seems to be towards selectivity owing to the high-powered stations now on the air. This need not disturb television enthusiasts, however, for their vision set, at least for the time being, need approach nothing in the form of a multi-station set, because there is only one B.B.C. station broadcasting the Baird transmissions. Everyone naturally is hoping that these facilities will be extended in the very near future, but as conditions change, modifications of a simple character can be introduced to meet any new phase. If in retaining flat tuning you experience any interference from a neighbouring broadcasting station cut it out with a wave trap.

For coupling the high-frequency valve to the detector valve two of the best methods are by choke feeding or transformer, with preference for the former. Employ adequate and efficient screening to ensure stability in working, while the use of a rheostat in the H.F. valve filament lead when working from accumulators serves as an admirable volume control if and when required.

In recent issues of TELEVISION actual constructional details of receivers suitable for handling the vision signals have been described at length, and interested readers are advised to refer to these articles, especially those from the pens of H. J. Barton Chapple and William J. Richardson.

A Basic Fact

The basic fact which must be kept in mind throughout when considering the wireless receiver can be stated in quite simple words. It is this:—

"Distortion will be avoided if the increased signal from the output of the valves differs from the original handed to the grid only in being greater in magnitude."

This proportionality factor cannot be emphasised too strongly, especially when dealing with the low frequency side of the set.

It is this section of the problem to which I shall devote attention in next month's concluding article of this series. Furthermore, the position as a whole will be reviewed from the beginner's angle.

A Novel Competition for Our Readers

Do you want to win a prize to the value of Two Guineas? Of course you do. Then read this page very carefully.

SO great was the enthusiasm aroused by our previous competition, and so much interest was shown in it by our readers, that we have decided to give them another opportunity not only of winning a prize but of realising even more fully, perhaps, than they do now the immense entertainment value of television.

Arrangements have, therefore, been made with the Baird Company for a special broadcast at midnight on Tuesday, November 11th, upon which our competition will be based.

Mr. Rupert Harvey, the cartoonist, whose amusing drawings have often entertained owners of "Televisors," has prepared a special set of twenty-eight drawings, each of which will illustrate one word, rather on the lines of the familiar picture puzzles.

For instance, there might be a drawing of a hen with the letter "T" in front of it, which, of course, would represent the word "then."

Each drawing will be placed before the transmitter for a few seconds, during which time "lookers-in" will be able to note down the word it represents, and when the end of the message has been reached each drawing will be shown again to enable competitors to check their first notes.

Solutions should be clearly written on a sheet of paper, which should also bear the competitor's name and address, and posted to

"Competition,"
Television Press, Ltd.,
505, Cecil Chambers,
Strand, London, W.C.2.

The sender of the first correct solution opened will receive a prize to the value of two guineas. If no correct solution is received, the prize will be awarded to the competitor whose entry contains the fewest errors.

The two guinea prize may be selected from the following:—

Baird Branded Components from the list of parts in the Baird Company's advertisement, which appears on the back cover of this issue.

Bound copies of Vols. 1 and 2 of TELEVISION at 12s. 6d. per volume.

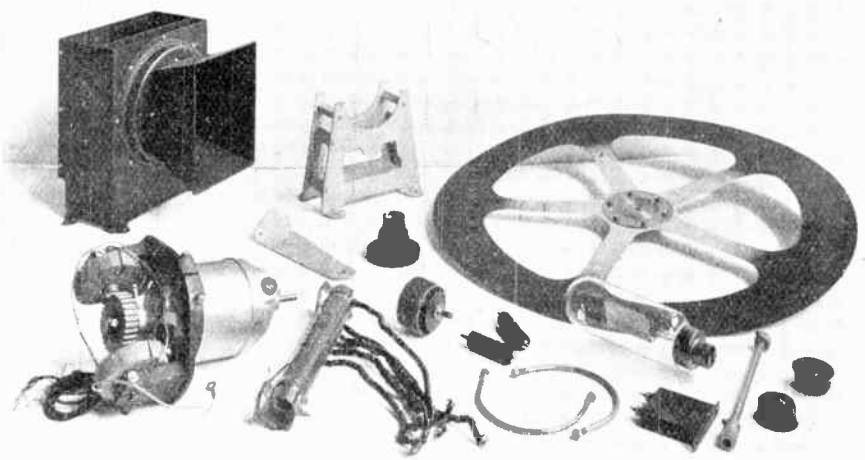
Annual subscription to TELEVISION at 7s. 6d. per annum.

Copies of "Television To-day and To-morrow" at 7s. 6d. per copy.

* * * *

A complete kit of Baird branded components as supplied by the Baird Company and from which a choice to the value of two guineas can be made by the prizewinner if he so desires.

* * * *



Baird Television at the Olympia Radio Exhibition

UNDOUBTEDLY one of the most attractive stands at the Radio Exhibition was put up by Baird Television, Limited.

As can be gathered from the accompanying photograph, the stand, although of rather small dimensions, was used to the fullest advantage and the apparatus was tastefully displayed. In addition the current issue of "Television" was on sale every day. The "Televisor," home constructor's set, and a full range of components, were laid out under the gaze of two bronze Robot figures, whose eyes were illuminated.

At the 1930 Radio Exhibition at Olympia the Baird Television Company had a most attractive stand. The original layout is seen from this photograph.

By means of a centre light from the roof of the stand, the "Televisor," by itself on a table in the rear, was prominently illuminated, and stood out in the dim light from the rest of the stand.

The walls were covered in silver tinsel material, surmounted by a painted frieze, from beneath which a soft light fell down on to the stand, and a very pleasing effect was achieved.

In an open competition for the most attractive stand in the Exhibition, run by the *Wireless Trader*, the Baird stand was awarded third prize.

Demonstrations

Through the courtesy and enthusiastic support of Messrs. W. H. Oates, of 195, Hammersmith Road, W., the Baird Company were enabled to instal a temporary studio showing both the transmitting and receiving apparatus. Tickets to visit this studio were issued from both the Baird stand and Messrs. Selfridge's stand at Olympia, and in spite of the inclement weather which prevailed during most of the Exhibition, some 14,000 interested people made the journey from Olympia (a distance of about half a mile). A continuous stream of people passed before the transmitter and receiver during the whole time that the show was open, and in many cases visitors were seen there as late as 11.30 at night.

In passing, it is interesting to note the high technical knowledge of the younger generation. Whereas the elder "lookers-in" were content to remark "Wonderful!" and "What will happen next?" the questions of the youngsters thoroughly tested the knowledge of the technical staff on duty. There is no doubt that the youth of this country are growing up definitely "television-minded."

Another point of interest that was noticed was the fact that in a very large number of cases complaints were made as to the shortness of the broadcasting hours allowed by the British Broadcasting Corporation.

The Baird Company have produced some very attractive literature, and this was freely distributed. We believe that this is the first time in the history of electrical science that an actual commercial price list and description of television apparatus has been available to the public.

We notice also that the Baird Company have produced a very efficient All-Mains Receiver specially designed for the operation of the "Televisor." There is fitted, however, a change-over switch, and this receiver can also be used for very efficient reception of the ordinary sound broadcasts.

C. & E.

The Musings of an Artiste

A GLANCE at the clock revealed the fact that there were only five minutes to go before the transmission was due to take place. Everything was in readiness in the Baird Studio.

The artiste sat in her chair before the transmitter, waiting. As she gazed at the little flickering light playing on her features she gradually became oblivious to her surroundings, and drifted into a reverie in which varying emotions struggled for supremacy as they flitted across her mental vision.

The wonder of it all impressed her with a feeling of awe that she had never experienced before. To think that in a few minutes her image would be flashed across thousands of miles, perhaps even to the furthest extremities of the earth. People of all nationalities and creeds would be "looking-in" and her image would be visible to every one of them at exactly the same moment. And that was not all—in addition to seeing her, they would hear her voice as well, coming to them across the vast expanse that separated them, forming a living link between her unseen audience and the England of thousands of miles away.

The mere thought was overwhelming, awe-inspiring. The attention of men and women from all parts of the world would be concentrated at that particular moment upon her. She would be the object of their absorbing interest. On her would be centred the gaze of everyone, as her image appeared in the humble dwelling of the worker or the palatial residence of the rich.

Perhaps, happy thought, "looking-in" was a brother in Egypt, an uncle in Africa, a friend in India. How they would greet her, the first moment of surprise over, as they gazed upon her face and noted her expressions. In fancy she travelled still further. "Looking-in" might be someone who, although a stranger now, was destined to be a friend in the future, or even a long-lost friend, who would thus be refound through the aid of television.

Her musings gave place to a sense of curiosity as she endeavoured to realise just how this marvellous result was achieved. Once again she experienced the feeling of awe, only to be quickly supplanted by a glow of pride to think that she had been singled out to assume for the moment an all-important rôle. For the moment she rivalled an earthly monarch in power. Hers was a rôle bringing in its wake unlimited possibilities, and yet exacting nothing but complete unaffectation and naturalness. It seemed so simple, and yet its potentialities——

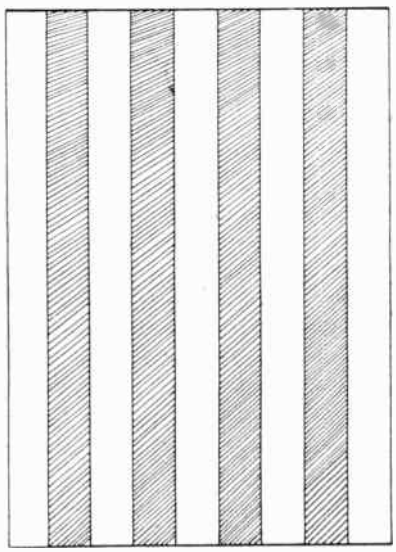
There was a stir in the Studio. The clock struck eleven, and the day-dreams of the moment before became the realities of the present. V. L. L.

After the Detector

By *William J. Richardson*

WHAT happens *after* the signals have passed through the detector stage of your wireless receiver has always fascinated me, and I make no excuse for again bringing this side of the question to the notice of readers. There are aspects which are apt to be overlooked and I propose to deal with some of these in order to refresh your memories.

I have seen very many demonstrations of television in different places under varying conditions, and found on several occasions that the image suffered from the effects called "motor-boating" or low-frequency oscillations. This is shown on the "Televisor" screen as a series of vertical black lines passing across



* * *

Fig. 1.—Motor-boating in your vision wireless receiver causes vertical black lines to travel across the image somewhat as illustrated.

* * *

the field of vision in a horizontal direction, see Fig. 1. To say the least, this is most annoying to anyone looking in, so let us take a rather broad view and examine all the likely causes.

Wireless Fashions

It is frequently a matter of comment that what some people are pleased to call "fashions" in radio apparatus seem to change with somewhat alarming rapidity. "A new kind of valve" they say, "is placed on the market, and no sooner have we purchased one of these valves, than we are told that some other portion of our receiver is out of date and must be replaced."

Now, while it is perfectly true that radio technique is developing and improving so rapidly that in order to keep an equipment constantly up to date, replacement of obsolescent components and occasionally complete rebuilding of the set is necessary, these changes are not dictated by the whims or the rapacity of radio manufacturers. It must be realised that radio is a highly scientific industry which has developed during the most active portion of a highly scientific era. It is only natural, therefore, that improvements follow each other with amazing rapidity, but although it is always possible to effect improvements in a receiver which, comparatively recently, represented the high-water mark in efficiency, it is not essential to the enjoyment of sound or vision broadcasting to embody every new invention as soon as it is announced.

The latest and most up-to-date models of receivers, speakers and so forth, are developed primarily for the service of the newcomer or for the established wireless man whose equipment has become out of date, but everyone should study technical developments and then, at convenient intervals, review their apparatus in the light of recent knowledge, and carry out such renovations or remodelling as may then seem advisable.

A Case in Point

There are, however, some instances where the adoption of a new or improved product immediately renders necessary alteration in some other portion of the set. A case in point is the substitution of the new and more efficient types of valves. During recent years the efficiency of receiving valves has been greatly increased, as may be proved by comparing the mutual conductance or "factor of goodness" of various makes with their counterparts of, say, two years ago. Methods of intervalve coupling have also been improved, with the result that the overall gain per stage in amplifiers has become very large.

It is when applying these new and more efficient valves to a receiver originally designed to operate with the older and less efficient ones that the trouble is often experienced in the form of howling, or that curious intermittent popping that has earned for itself the title of "motor-boating." The blame for these troubles should not be laid on the new valves, the fault being in almost every instance due to the fact that the new valves are being used in an old and probably inefficient receiver. The only reason for this trouble, the correct technical description for which is "low-frequency oscillation," is unwanted coupling between stages, which may be due to any one of several causes.

In the first place, if by chance the low-frequency transformers used for intervalve couplings are of very old pattern, it is quite likely that there is leakage of a portion of their magnetism and due to this leakage a portion of the energy in the circuit of one transformer is transferred magnetically to another transformer

circuit, and is reamplified, this amplification being cumulative, and finally resulting in the oscillation otherwise upsetting the vision or speech as the case may be.

Resonance Frequencies

Another possible cause of low-frequency oscillation may be the existence of one or more "resonance frequencies" in the characteristic of the low-frequency transformer. Some transformers, especially those of early pattern, do not give equal amplification throughout the range of required frequencies. At one or more definite frequencies such transformers may give a degree of amplification enormously greater than that over the remainder of the frequency band which has to be covered. This fact, combined with the higher overall amplification obtainable with modern valves, may easily give rise to the difficulties mentioned.

The only cure for oscillation arising from either of the above-mentioned causes is to substitute for the old and inefficient transformers, components of modern design and high performance. A typical example of advanced transformer design which can be called to mind is the Mullard "Permacore" transformer which, by the use of a correctly designed core of special high-permeability alloy and by careful calculation of the windings, is free from resonance peaks throughout the audio-frequency band and has negligible magnetic leakage.

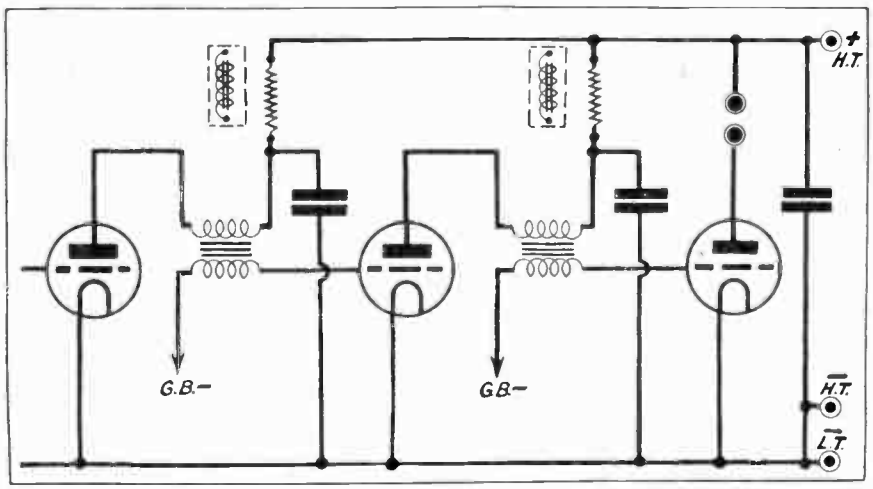


Fig. 2.—A circuit diagram of a three-valve L.F. amplifier exemplifying the use of wire-wound anode resistances and large by-pass condensers as a means of obtaining stability.

Low-frequency oscillation is caused frequently by electrical coupling between circuits due to a fairly high resistance common to more than one circuit. Usually a portion of the high tension battery is common to two or more anode circuits, and if the resistance of this common portion is high, the alternating voltage drop across it due to the current in one circuit will be impressed upon other circuits with the result that energy will be fed back from one circuit to another, and cumulative amplification with consequent oscillation, produced. The cure in this case lies in ensuring that the various high tension voltages used for the set are obtained through separate voltage-dropping resistances from one maximum tapping on the H.T. battery or battery eliminator.

If a type of eliminator not including such provision is to be used, or if the high tension supply is obtained from dry batteries, it is necessary to feed the anode of each valve from the maximum tapping of the eliminator or battery through a separate resistance of such value that the requisite voltage drop is obtained. These resistances should be by-passed to earth by a fixed condenser of 2 mfds. capacity such as indicated in Fig. 2.

Always "Decouple"

Back coupling is sometimes caused by the output leads, especially if they are carrying a large anode current. A certain cure in this case is the adoption of a choke filter circuit, which diverts the direct current component of the anode current, and permits only the audio-frequency component to pass through the leads.

A further cause of motor-boating is the existence of high-frequency currents in the low-frequency portion of the receiver. No detector valve works at 100 per cent. efficiency, and in all receivers a very small amount of high-frequency energy passes the detector valve into the low-frequency amplifier. In most instances undesirable effects due to this high-frequency energy can be avoided by by-passing the primary of the first low-frequency transformer with a fixed condenser of about ·0001 mfd. capacity.

Of all these suggestions, I think that perhaps the one most applicable to vision working is the fairly high resistance common to more than one circuit. We know that resistance capacity coupling generally is capable of giving the best image, and in consequence magnetic leakage of transformers will not apply. Thus, if you want to ensure stability, decouple your valves throughout and you are sure to be on the safe side.

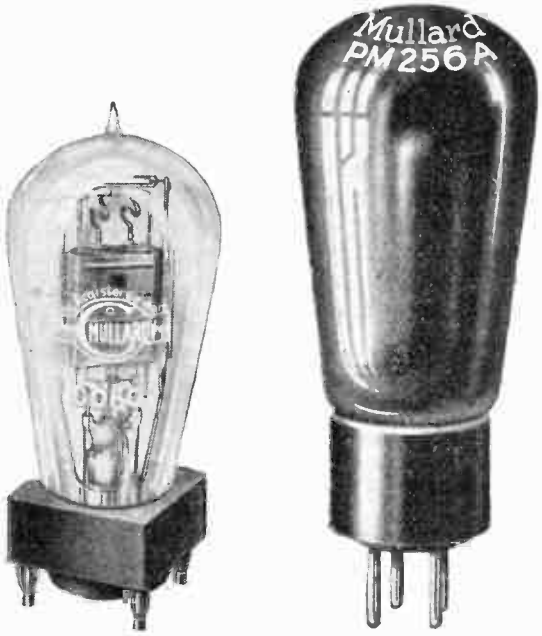
Valve Choice

Another point which I should like to dwell on in this article arises from the many questions which are raised as to how the valves for a vision (i.e., power) amplifier should be chosen.

There are, on the market, so many types of power amplifying valves that potential users are apt to find a difficulty in selecting the power valve which will best suit their needs, and the matter is complicated by the multitude of figures regarding the characteristics of their valves, published by the various manufacturers. The figures usually quoted include the "grid bias" of the valve, the "amplification factor," the "impedance," and the "slope" or "mutual

conductance. Which of these characteristics determine the suitability of the valve as a power amplifier? On what basis should the merits of two valves be compared?

Before answering these questions, it is necessary to consider what actually happens in a power amplifier. For the purpose of explanation let us take the case of a set which is receiving the sound broadcasts, and imagine both filament current and H.T. are switched on, but no signals are being received. A steady direct current will flow in the circuit consisting of the H.T. battery, the speaker, and the anode-filament path of the power valve. This direct current



On the right, a super-power valve, while on the left is a valve designed to handle very large A.C. outputs.

will, of course, produce no sound in the speaker, except a "plonk" or click when switched on or off. Now imagine that signals are being received. Impulses at low frequency, corresponding to the sounds produced before the microphone, will be applied to the grid of the power valve, and will set up variations in the current flowing through the speaker, these variations corresponding exactly to the grid impulses. The power available to operate the speaker, and therefore the volume of sound obtainable, depends entirely upon the *extent of the variations* in the anode current of the power valve, and not *upon the actual value of that current.*

A Simple Analogy

Perhaps this will be made clear by a simple analogy. Imagine a boat anchored in the middle of a lake. If the surface of the water is perfectly smooth, the boat will remain stationary—this represents the diaphragm of a speaker when only a steady direct current is flowing through the winding. Now imagine the surface of the water to be disturbed by a breeze. The boat will rise and fall with the waves, and the amount of motion will depend entirely upon the height of the crests of the waves and the depth of the troughs. In a similar way, the movement of the diaphragm of a speaker depends upon the "depth of modulation," i.e., the amplitude of the audio-frequency variations in the anode current of the power valve, better known as the A.C. output of the valve.

Other things being equal, the A.C. output of a valve can be increased by increasing the extent of the voltage variations applied to the grid, but there are limits beyond which the "grid swing" cannot be increased without introducing distortion. There are, however, other factors which control the A.C. output of a valve. There are its amplification factor and impedance.

Without going into fairly advanced mathematics it is difficult to give a wholly satisfactory explanation of the effect of these factors, but in general it may be said that, under identical working conditions, a valve with a high amplification factor and low impedance will give a greater A.C. output than a valve with a lower amplification factor or higher impedance.

The mutual effect of the amplification factor and impedance is expressed by the "mutual conductance" or "factor of goodness" of the valve. When selecting a power valve, therefore, the valve of higher mutual conductance will be preferred. Of two valves having approximately equal mutual conductance, the one having the higher amplification factor will be the better. By using a valve with a high amplification factor less intermediate amplification between the detector and power valve is necessary and the risk of introducing distortion is correspondingly reduced.

"Super-Powers"

Ever since the introduction of broadcasting, manufacturers of valves have been steadily improving the quality of their products, the tendency every year being towards increased values of mutual conductance. The advent of new types of speakers requiring ever-increasing power for their operation, and bearing in mind that a "Televisor" requires an undistorted output of 1½ watts to work it efficiently, has led valve makers to turn their attention more particularly to the design of efficient power valves. Valves of the "super-power" class such as the Mullard P.M.252, P.M.254, P.M.256, and P.M.256A for use with 2-volt, 4-volt, and 6-volt supplies, are now employed as standard in all domestic receivers where robust reproduction is required, and valves capable of still bigger A.C. output are made for operating large radio-gramophones, public address equipment, the "talkies," special television experiments, and so forth.

With these factors kept uppermost in mind, I think readers will be able to turn to their low-frequency vision amplifier, that is, after the detector, with a more intelligent appreciation of its requirements, and in a future article I propose to deal at greater length on the important problem of the meaning of valve characteristics. A better understanding of these items will help the experimenter considerably and remove the "trial and error" methods from valve choice.

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.

INTERESTING CORRESPONDENCE FROM WILLIAM J. RICHARDSON.

To the Editor of TELEVISION.

DEAR SIR,—I am sure your readers would be interested in the attached correspondence which has arisen primarily as a result of my article on a wireless receiver for television, which appeared in the October issue. I felt that its publication might prove of assistance to others who might experience the same difficulty.

Thanking you for your interest.

Yours faithfully,
WILLIAM J. RICHARDSON.

London.
October 1st, 1930.

W. J. RICHARDSON, Esq.

DEAR SIR,—I have read with great interest and enthusiasm the various articles written by you and published in TELEVISION. I would like to tender my thanks and appreciation for the excellent self-explanatory way they have been compiled.

I am, however, especially interested to see that in the October issue a three-valve vision circuit is reviewed by you. As I built this particular receiver some four months ago from a circuit I obtained from Messrs. Baird Television, Limited, possibly you will be able to help me with a difficulty I have been unable to overcome in spite of a lengthy series of various painstaking experiments.

Being unable to directly couple the neon tube and coils into the plate of the pentode, owing to my H.T. being limited to 250 volts, I have been compelled to resort to other methods of connection, such as choke feeding and transformer coupling, but up to the present I have been unable to devise a satisfactory arrangement.

With either choke feed or 1–1, 1·6–1, 2·7–1 transformer coupling, very serious distortion is indicated on a good strength signal by my milliammeter dropping from a plate current reading of 26 milliamps to 17 milliamps constant, until I detune the signal down to a very poor strength, when the needle returns to normal.

For your information, the receiver functions extraordinarily well on broadcast reception, and excellent undistorted volume, together with first-rate quality, is obtainable on my low-resistance moving coil speaker, using a transformer ratio of 25–1, and also on my balanced armature speaker, preferably with choke filter output.

My own limited technical impressions are that the difficulty is due chiefly to the very high impedance of the P.T. 625, and that it is solely a matter of correctly matching the impedance of the television circuit (coils, neon, choke or transformer) with the impedance of the pentode.

Possibly you have conducted experiments in this direction, and therefore if you can offer me any assistance towards overcoming this evasive and persistent difficulty I should be greatly indebted to you. Perhaps it would be as well to mention that I have previously obtained very good results with choke-feeding when used in conjunction with my old set, which consisted of S.G., anode bend-transformer coupled to medium-size power valve of the 3,000 ohms class.

In conclusion, any advice or suggestions you may be able to give me will be very greatly valued and appreciated.

Yours faithfully,
F. G. R. GREENLAND.

24, Stanley Street, New Cross, S.E. 8.
September 29th, 1930.

F. G. R. GREENLAND, Esq.

DEAR SIR,—I thank you for your letter of the 29th ultimo sent to me care of the TELEVISION Magazine. Your complimentary remarks in connection with my contributions to the columns of TELEVISION are appreciated, and I hope that further efforts from my pen will continue to prove of interest.

With reference to the query you raise, the distortion undoubtedly arises from the method of coupling to the "Televisor." Since the rated impedance of the specified P.T. 625 valve is 43,000 ohms, it follows that the transformer primary or choke impedance must be of the same order. This can only be effected by employing chokes or transformers designed specially for use in conjunction with pentode valves, and I can personally recommend for your consideration the products of Varley, Igranic, and R.I.

Trusting this information will enable you to achieve the good results of which I know this set is capable.

Yours faithfully,
WILLIAM J. RICHARDSON.

October 1st, 1930.

SCANNING—IS IT NECESSARY?

To the Editor of TELEVISION.

DEAR SIR,—Whether scanning is an absolutely essential part of the process of television has been a matter of some controversy almost from the birth of the practical science.

Let us first understand clearly what is meant by scanning. It is a process whereby the field of view, including, of course, the object to be televised, is split up into a number of small sections which are transmitted one after the other, and are reassembled in the same order at the receiving end, to form a complete image. Each section represents an intensity of light. The whole process is repeated several times per second. The order in which the sections are made to follow each other does not matter in the least, though, in the nature of things, they take up some regular order, depending on the method of scanning employed. The number of sections into which a given field of view is divided governs the degree of detail in the resultant image.

The theory of scanning and the problems connected therewith are well known. The various television systems now being developed in Europe and America differ only in the method of scanning employed. Baird, Mihaly, Karolus, Jenkins, and Belin all make use of mechanical processes—sets of spiral holes and lenses, revolving and vibrating mirrors, curved prismatic discs, etc. The General Electric Company of America have recently developed a system which makes use of the cathode ray oscillograph. This is a noteworthy advance, as it dispenses with moving parts at the receiving end, and gives great flexibility of control in other ways, but the expense of the apparatus places the system outside the commercial field.

But what if this scanning process could be eliminated altogether? What if the entire image could be made to reach the receiving screen simultaneously? There would then be no splitting up of the field of view with the attendant loss of detail. The ideas which follow are intended to show that such a system is at least a logical possibility.

Imagine a spectrum of colours to be thrown upon a screen before which the object to be televised is placed. Then one side of the object would be illuminated with red light, and the other with violet light, each part of the object from left to right receiving light of a different colour. Now suppose that only a small part of the spectrum was used, say part of the infra red. The rays reflected back from the object could then be heterodyned by a single infra-red ray, giving rise to a band of frequencies capable of being dealt with by ordinary radio methods. A second heterodyning process would give rise to a band of audio frequencies, which might be transmitted by wire, or used to modulate a carrier wave.

It will be noticed that the object has been taken as existing in only one dimension, so to speak, but this does not appear to present any insuperable difficulty. (There is at present no known means of producing a heterodyne or beat frequency between two infra-red or light waves, a curious circumstance in view of our present knowledge of the subject.) It will be appreciated that the basic idea is to correlate position on image and object to frequency, the whole gamut of frequencies being received in just as immediate and complete a manner as is the impression on a photographic plate, or on the retina of the eye.

It is not generally known that the scientist, Nipkow, as early as 1888, devised a system of television very similar to that developed by Baird, but of course he was unable to put it into practical form as there were then no such things as photo-electric cells and neon tubes. He called his invention an "electric telescope," a name singularly appropriate to a system in which no scanning would be employed.

Some time ago our columns gave details of a cathode-ray television receiver, to which reference is made by our correspondent, Mr. Royds. Here we see Dr. Zworykin and his new cathode-ray tube, which he calls a "kinescope." The television images appear on the round flat end at right.

Yours faithfully,

Herts, *Oct. 4th*, 1930. J. A. L. ROYDS.

A GERMAN OPINION OF SCREEN TELEVISION.

To the Editor of TELEVISION.

DEAR SIR,—May I inform you that I had the opportunity of seeing a demonstration of the large Baird screen "Televisor" held in the Berlin Scala on Wednesday night (September 24th)? "Das Fern-Sprech-Sehen" (as it is named in Germany) was announced in appropriate words by an actor standing on the stage. When the light was darkened in the large hall an expecting murmur was to be heard. A large and bright televised image of a man's face appeared between the parted curtain and spoke to

Miss Maud Hansen, soubrette, who was one of the German girls appearing in Berlin with the Baird screen, and to whom reference is made by Mr. Hewel.

the audience (speech quality not better than in the usual "talkies"), which was apparently astonished at the quality of the image and uttered an appreciating "Ah!" The gentleman on the screen explained the technical arrangement and introduced the performers: Mr. Reiss, baritone; Felix Josky, writer; Maud Hansen, soubrette, and Mr. Max Stein. The audience was also invited to utter special requests. (A few of them were: "Put out your tongue!" asked by a doctor; "Stand on your head!"; "Miss Maud Hansen shall kiss Felix Josky!" (He never dreamt of it!) Mr. Baird's photograph concluded the fascinating demonstration, which was followed by long applause.

The well-defined images were brighter than I had supposed. The dark parts were not black but rather in sepia tone. Half-tones graduated over a large scale! The reflexes on Mr. Josky's spectacles were so bright that I had fear for the filaments of the small lamps, a few of which were not in operation (to be seen only with the aid of an opera glass, at least from the gallery). From time to time I also observed weak shadows extending above the hairs of the televised person (I made the same observation in my "Televisor," but always thought it was due to the characteristics of the neon). Synchronisation quite effective; images moving slightly up and down at times (not annoying, however).

Picture somewhat out of frame horizontally (two lines to the right corrected at the end of the performance). Flickering really weaker compared with the neon image; very fine success if one is thinking of the increase of flickering after an increase in brightness.

You see, that there were some (really negligible!) deficiencies.

Of course, there is still much to be done in television, especially by increasing the number of elements (*e.g.*, 120 lines—vertical—four times the Baird ratio, 70 elements high) placed side by side combined with the use of short waves, as proposed by Mr. Baird.

Yours faithfully,

HORST HEWEL.

Berlin-Wilmersdorf, Laudhausstr. 13, Germany.
September 29th, 1930.

PHOTO-ELECTRIC CELL VIBRATIONS.

To the Editor of TELEVISION.

DEAR SIR,—I have read with great interest the report on "Natural Vibrations of Photo-electric Cells and their Extinction by Light," in the September number of TELEVISION. It may be of interest to mention in this connection that this phenomenon has been known for several years, and has been described by Dr. N. R. Campbell (see e.g., Philosophical Magazine, Vol. III., May, 1927, page 1050): "If . . . . a moderate illumination is applied to the cell, the oscillations cease, because the current which lies on the unstable portion of the dark characteristics lies on the stable portion of the illuminated characteristic."

The stopping of the oscillations is governed by space-charge conditions in the photo-electric cell, and the effect is therefore not entirely reversible in all cases. This point has to be considered when technical applications of the effect are proposed.

In the paper mentioned above, Dr. N. R. Campbell mentions the possible use of the method for the transmission of pictures by radio.

Yours faithfully,

RICHARD RUEDY.

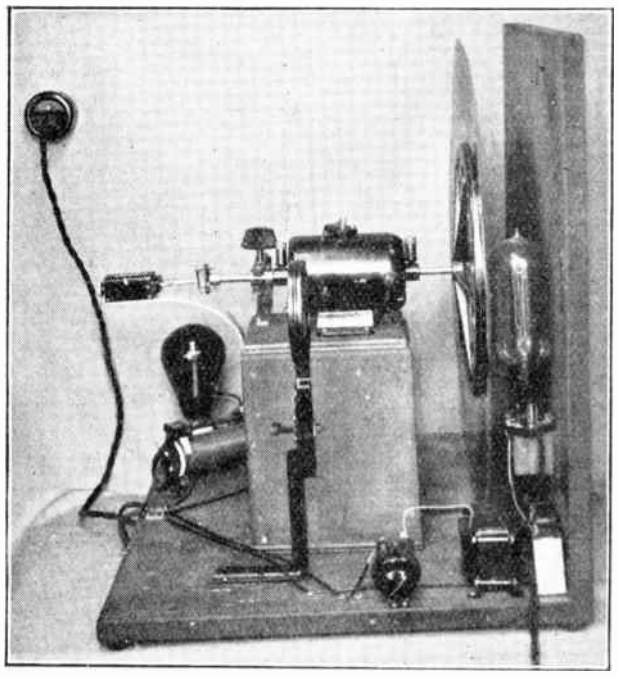
42, Maitland Street, Toronto.
September, 20th, 1930.

THIS SIDEBAND CONTROVERSY.

To the Editor of TELEVISION.

DEAR SIR,—Referring to the sideband controversy, I should like to inform you that, in the light of fresh evidence, I am of the opinion that Mr. Bailey and I have been at cross-purposes on several points. The fault lies on my side, as I have hitherto been unable to express myself sufficiently clear owing to lack of data.

A modulated carrier wave can be resolved mathematically into three components, but these three components cannot be isolated, and a triple transmission of these component frequencies, with correct phasing, would be dissimilar to the single transmission.



Josef Häring, of München, has successfully received the Baird television transmissions on the apparatus shown in the above photograph.

So much I have proved to my own satisfaction, and this involves the discredit of the ether as a medium of transmission. Presumably the waves do not affect each other, nor are their transient amplitudes algebraically additive at any point in a common medium, but each transmission is self-contained. Each and every transmission will, however, affect a conductor in its path, and, if current results, such a conductor will become a secondary centre of propagation.

Also, if two equal amplitude transmissions strike an aerial, and their effects are additive, then the energy extracted will be four times that which would be extracted from a single transmission, thus giving the erroneous impression of two waves superimposed in a common medium. This is a contributory cause of the wipe-out of weak signals in the neighbourhood of high-powered stations.

For the present I will leave the subject there, and would thank you for the facilities you have granted me for voicing my ideas and opinions.

Yours faithfully,

R. S. SPREADBURY.

30, Holmesdale Road,
Teddington, Middlesex.
September 4th, 1930.

An Ingenious "Teletester"

(*Concluded from page* 377.)

discs together by means of a screw and nut passing down the centre hole, taking care that this screw does not touch any sockets or pins.

Level up the socket tops so that they are of the same height and the result will be as indicated in Fig. 3A diagrammatically and Fig. 3B pictorially, namely, an adaptor with a split filament socket to measure current and connections to the remaining plate and filament sockets. Connect your four-way lead to the four terminals and you are now ready to carry out all the desired measurements. These will be indicated next month, but in the meantime get your apparatus ready according to the very full instructions which I have given you and no time will be wasted.

(*To be continued.*)

The Television Society

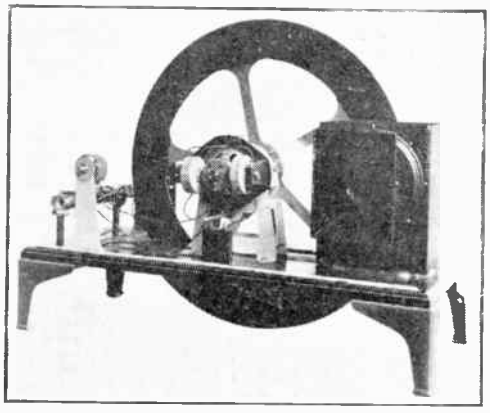
The Television Society held its opening meeting of the season on Wednesday, October 8th, the venue being University College, Gower Street, W.C. 1. Mr. J. H. Owen Harries, A.M.I.R.E., delivered a lecture on "Some Developments in Television Based on Quantitative Analysis," illustrating his remarks with lantern slides. The date of the next meeting is Wednesday, November 12th, and non-members may obtain cards of admission on application to the Head Office of the Television Society, 4, Duke Street, Adelphi, W.C. 2.

BUILDING YOUR OWN?

BE SURE TO USE

BAIRD BRANDED COMPONENTS

IN addition to the "Televisor" Home Reception Set we can supply a complete range of BAIRD branded parts for the home constructor. We can also provide any single part of the apparatus, thus enabling the experimenter to build his own experimental apparatus.



WE feel that all those who are keenly interested in television should know and definitely realise that BAIRD branded products are the *only* genuine television components. The successful reception of the Baird transmission is dependent upon the use of *Baird* instruments only.

PRICE LIST

Complete KIT OF PARTS for the Home Constructor (as under)	£	s.	d.
	16	**16**	**0**
Motor and Synchronising Gear	7	7	0
Motor Bracket, Clamping Bolts and Nuts	1	14	0
Lens—Large	0	13	6
„ Small	0	7	6
„ Box Assembly, with Viewing Tunnel (6 pieces)	1	4	0
Neon Lamp	1	5	0
„ „ Holder	0	6	3
Disc	2	2	0
Zenite Resistance and Supports	0	17	0
Resistance, with Bracket and Control Knob	0	6	3
Spindle Assembly, with Control Knob and Screws	0	5	9
T.C.C. Condenser	0	8	0

The following are other Spare Parts not included in the Kit of Parts:	£	s.	d.
Main Casing	4	10	0
Well Casing	1	1	0
Neon Casing	0	2	6
Terminal Casing	0	3	4
Wood Base	0	18	6
Feet for Base (4)	0	11	0
Terminal Board	0	9	6
Screws and small Parts for Base Assembly	0	3	0
Screws, &c. (various)	0	3	0
Flexible Lead and Adapter	0	5	6

BAIRD TELEVISION LIMITED

133, LONG ACRE - - LONDON, W.C.2

Telegrams: "TELEVISOR, RAND, LONDON" Phone: TEMPLE BAR 5401

Printed by HAZELL, WATSON & VINEY, LTD., 52, Long Acre, London, W.C.2, and published for the Proprietors, TELEVISION PRESS, LTD., 505, Cecil Chambers, London, W.C.2, by THE ALDINE PUBLISHING CO., LTD., Crown Court, Chancery Lane, London, W.C.2. Address for advertisements: "TELEVISION" ADVERTISEMENT DEPT., 505, Cecil Chambers, London, W.C.2. Sole Agents for America, THE INTERNATIONAL NEWS COMPANY, LTD., 131, Varick Street, New York, U.S.A. Registered for transmission by Canadian Magazine Post. Entered as Second Class Matter, March 15, 1929, at the Post Office at Boston, Mass., under the Act of March 3, 1879 (Sec. 397, P.L. and R.).