4-INCH X 22-INCH HOME PICTURE (SEE PAGE 196)

Television and SHORT-WAVE WORLD

1/-
MONTHLY
APRIL, 1937
No. 110. Vol. x.

MAGNETIC FOCUSING

CHASSIS OF FERRANTI RECEIVER

BUILDING FOUR-BAND ULTRA-SHORT WAVE RECEIVER

5-METRE SUPER-HET

RECEIVER OPERATING HINTS

PROGRAMME CRITICISM

SCANNING FAULTS —AND HOW TO REMEDY THEM

THE COAXIAL CABLE

BERNARD JONES PUBLICATIONS LTD.
CHANSITOR HOUSE. CHANCERY LANE
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THE FIRST TELEVISION JOURNAL IN THE WORLD

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TELEVISION and SHORT-WAVE WORLD

Special Features

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BERNARD E. JONES.

Editor :
H. CORBISHLEY.

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COMMENT OF THE MONTH

Demonstrations

THAT the public are taking very full advantage of the free demonstrations of television in the various demonstration centres in and around London is evidenced by the statement of the G.E.C. that up to the 18th of March 65,000 had viewed programmes in the showrooms of the G.E.C. and their dealers since the B.B.C. television service began. For one concern this is a very large figure and if other figures were available the total number would be very considerable.

It is unfortunate in one respect that many public demonstrations have been staged as publicity stunts and that in many cases, particularly at the large stores, there is an entire lack of showmanship which is not conducive to creating a real interest in television in the public mind. The crowds are ushered into the viewing rooms and no regard is given to programme continuity, neither in many cases is sufficient time given for visitors to become accustomed to the subdued light before they are moved on. Even at the cinema a certain time is necessary before the eyes accustom themselves to the altered conditions and in television with a smaller screen and less light this is a matter of much greater importance. Demonstrations of this nature, while satisfying a certain amount of curiosity, are, in our opinion, definitely doing harm to television, though presumably they serve the purpose of attracting visitors to the stores. Those who make use of television for publicity purposes should at least take care that their patrons are seeing it under proper conditions.

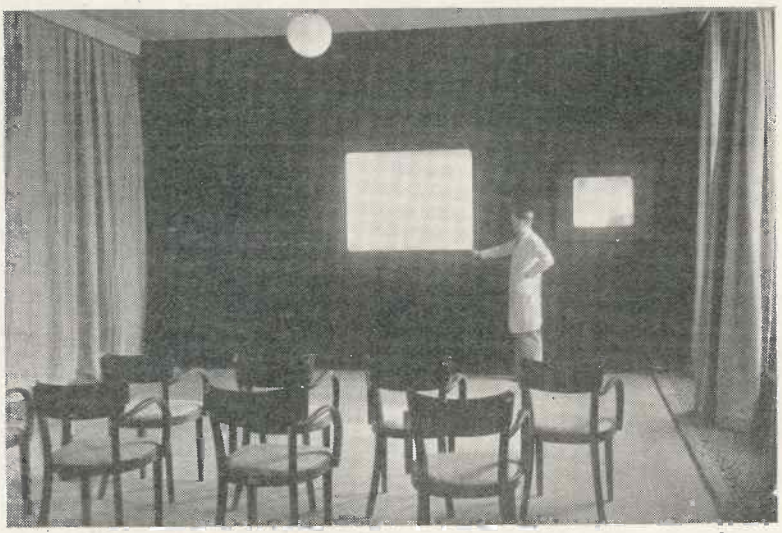
Television Experience

LAST month we mentioned that many dealers and service people have built or are building the receiver which was described in our October, November and December issues of last year, in order to obtain experience which will undoubtedly be of great value to them later. There is no better way of securing knowledge of the principles and functioning of a television receiver than can be obtained by actual construction and getting it into working order, and those that do so are bound to profit eventually. The suggestion is well worth serious consideration by all those who are engaged in the radio trade.

WE SEE SCOPHONY'S LATEST SYSTEM

LARGE BRIGHT PICTURES BY OPTICAL-MECHANICAL METHODS

AN ACCOUNT BY THE EDITOR OF A DEMONSTRATION OF THE SCOPHONY SYSTEM WHICH PROVIDES LARGE SCREEN HIGH-DEFINITION PICTURES BY OPTICAL MECHANICAL METHODS.



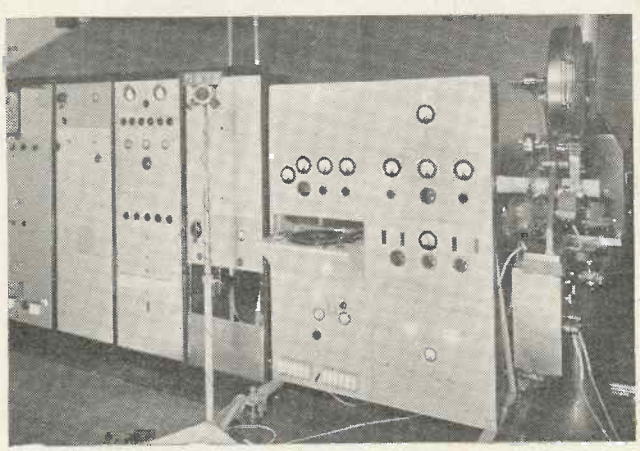
View of the Scophony Theatre showing the 5 ft. × 4 ft. screen, and next to it the 24 ins. × 22 ins. screen.

FROM time to time we have been able to provide our readers with exclusive information regarding the progress made in the development of the Scophony system of television. Originally, it will be remembered, Scophony employed a unique scanning system named the Stixograph. The particular virtue of this system of scanning was that the greatest possible advantage was taken of the modulated light available. Light modulation was by means of a double-image Kerr cell with its well-known low efficiency. Since that time, however, Scophony have developed a special type of liquid cell which was fully described in our issue for May of last year.

Plenty of Light

The introduction of this special light relay which permits of the modulation of an almost unlimited amount of light put an entirely different complexion on the possibilities of optical-mechanical systems and made possible the use of a comparatively simple scanning system and one which would readily lend itself to adoption for the standard set by the Television Committee. In fact, so efficient is this newly developed light relay that the scanning system employed is relatively of but little importance. The whole secret of the success of the Scophony system can be summed up in four words, "plenty of modulated light."

Briefly, the Scophony light relay consists of a device for passing a beam of light through a liquid in which



View of the 240-line film transmitter; from right to left special Scophony projector head; next, vision and sound amplifiers with power supplies; next rack, the line amplifiers; then synchronising amplifiers, synchronising mechanical generator and at extreme left the check receiver.

The Scophony home receiver was exhibited at last year's Radio Exhibition. The screen size was 14½ ins. × 10½ ins.

supersonic waves are propagated. Supersonic waves of wavelengths down to a fraction of a millimetre are readily produced in liquids by the agency of quartz crystals, and are propagated from a flat crystal as plane wave-fronts of compression and rarefaction.

A light beam, passing through the liquid parallel to these wave fronts, is retarded more by the compressed regions than by the rarified ones, and since the supersonic waves are regularly spaced, a regular series of diffraction spectra are obtained.

Another very important feature is that with this relay it is possible to project on the screen a number of light spots simultaneously, the number used at the present time being 77 and with the scanning device stationary these appear on the screen as a line of light instead of as a spot as in all other systems. It will be appreciated that this possibility increases the efficiency very considerably.

The relay is of very simple construction and merely consists of a cell with transparent windows in the direction of the light beam and a quartz crystal at right angles to it to which the signal voltages are applied. The liquid employed is kerosene.

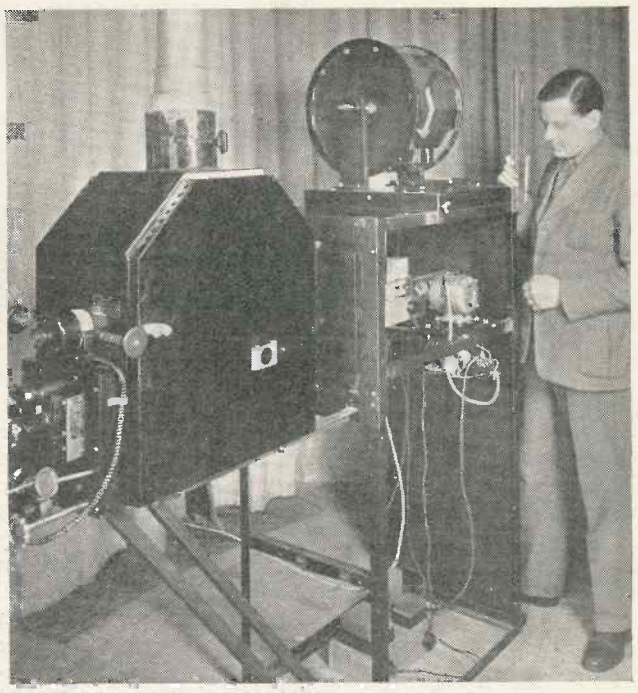
Recent Progress

The last time we paid a visit to the Scophony laboratories was at the beginning of June, 1936, on which occasion we saw *home* pictures 10 ins. by 8 ins., though a promise was held out of larger home pictures, namely 16 ins. by 12 ins.; we also saw the beginnings of a medium screen picture, 5 ft. by 4 ft.

We have been aware that since that time further developments had taken place and we therefore very eagerly looked forward to some interesting developments, and at last we were given an opportunity by Mr. S. Sagall, Scophony television chief, to " look-in " on their progress.

Scophony is carrying on work in two directions: for the home and for the cinema.

As far as home television is concerned, Scophony have exceeded their own promises, and their ambition has since grown. They have decided that for the home nothing less than a picture comparable in size to the home cinema would be good enough. They have produced a picture two feet wide by 22 inches high. The picture when viewed by us last week, was of a clarity of detail, contrast and brightness equal to any we have seen, and, of course, it was larger. Indeed, at a distance of about 10 ft. one almost forgot that one was looking at a television picture. It looked so much like a home cinema. The picture is projected on to a flat screen from the rear, and the receiver is comparatively simple and should be easy to operate. This picture was 240 lines and 25 frames per second, as was also the larger picture described below. In both cases transmission was by means of a Scophony transmitter in another part of the building, the connection being by line. An arc lamp, which was entirely automatic in action was used as the light source though later we saw the same type of receiver operated with a special gas-discharge lamp which is now in process of development. Results with this were equally good and this lamp only requires 25 per cent. of the current taken by the arc.



5 ft. × 4 ft. projector showing high-intensity arc, slow speed mirror drum and high-speed scanner motor. This projects a picture of considerable brightness on to a rear projection screen. The size of the apparatus can be gauged from the engineer standing at the side.

View of experimental receiver with picture 24 ins. × 22 ins., Mr. J. Sieger of the Scophony laboratories standing at the side.

Mr. Solomon Sagall Scophony Television Chief.

The Medium-screen Receiver

A no less impressive achievement was the demonstration of the improved medium-screen receiver. We saw a quarter of an hour's demonstration on a screen 5 ft. by 4 ft., which in our opinion would be *good enough* to be introduced al-

ready at this stage for audiences of between five hundred and a thousand people.

The picture quality was astonishingly good, the amount of detail being sufficient for showing most elaborate scenes from a film, with a lot of crowd scenes with hundreds of players. The Scophony technicians seem, however, very ambitious and are working on still larger screens, approximating more the size of screens used in cinemas.

The basic principles involved in large screen reception are similar to those incorporated in the home receiver, the difference being in the size of equipment and in the nature of the light source used, thus, for instance, the Medium Screen Receiver uses a standard cinema arc.

Since our description of the Scophony system last July an alteration has been made in the scanning arrangements, though the same principle is used, viz., a high-speed and a low-speed scanner. The high-speed scanner now consists of a polygonal disc about 2 ins. in diameter and ¼ in. thick. The low-speed scanner has also been modified though it still comprises an ordinary type of mirror drum; the length of the mirrors has been increased, however. The question of synchronising did not arise with the apparatus demonstrated as both transmitter and receiver were driven from the same mains by synchronous motors. The synchronising system, which Scophony intend to employ appears to be quite practicable and there would not appear to be any difficulty in this respect. Delay in development has been caused, we understand, by the adoption of a single standard which has necessitated considerable modification.

The photographs on these pages show the Scophony apparatus, but it should be understood that these are the laboratory type.

Arrangements are now in progress for turning the first laboratory models into commercial receivers for the reception of the Alexandra Palace broadcasts. We were impressed by the fact that the adjustment and lining up of this type of receiver does not appear to demand any great accuracy; this was apparent from the nature of the adjustments provided in the optical system which in no case were anything more than a slot and thumb screw, and we understand that the optical arrangements are of a commercial standard which does not call for any great degree of accuracy

It has always been the endeavour of TELEVISION AND SHORT-WAVE WORLD to obtain first-hand information of television developments all over the world. On the strength of information to hand, we can say that to the best of our knowledge there is no other television company or experimenter in the world, who has to-day anything equivalent in size of picture for the home and larger screens to those shown by Scophony. This is, therefore, an achievement of which Britain can be very proud. At an early date we hope to be able to give a full technical description of the Scophony system.

The Pulse Generator at Alexandra Palace

THE function of the pulse generator is to produce all pulses and frequencies for synchronisation and the operation of the cameras. The pulse generator is in two bays. In the first the basic frequencies are generated by multiplying the frequency of the supply mains or of a generator which can be independent of the supply mains. The second bay further amplifies and selects the correct pulses (which are multiples of those generated in the first bay) and amplifies, corrects and diverts them to whatever part of the system requires them.

The synchronising impulses which are to be transmitted with the picture signal are added in the synchronising mixer unit. In order to prevent excessive D.C. reaching the synchronising mixer the first stage in this unit is a further diode. Signals from this diode are fed to the grid of an amplifier valve in the anode circuit of which is a second valve, the grid of which is fed with high and low synchronising pulses supplied by the pulse generator. The output therefore from the combined anode circuits of these two valves is now picture signals plus high and low synchronising pulses. This output is fed through a D.C. coupling unit to the grid of the output valve of this unit.

The complete signals to be radiated are now fed to the distribution amplifier. These duplicated amplifiers consist of an input stage and five alternative output stages, one of which—that feeding the transmitter—has two valves in parallel.

The line amplifiers consist of one stage of amplification and a low impedance output stage. Any picture signals from distant locations will enter the transmitter system through these amplifiers.

Three modulator units follow. Signals from the line amplifiers are amplified by one DA.100 feeding two DA.100's in parallel in the sub-modulator unit, between which and the sub-modulator is the black level unit which ensures that the signals are such that *at the Receiver* the degree of black is maintained constant over the picture tone range.

The sub-modulator consists of one D.E.M.3 amplifier D.C. coupled to two D.E.M.3 valves in parallel.

The final moludator stage consists of one C.A.M.3 valve D.C. coupled to a C.A.T.6 operating with an H.T. supply of 5,000 volts and handling a swing of the order of 2,000 volts peak.

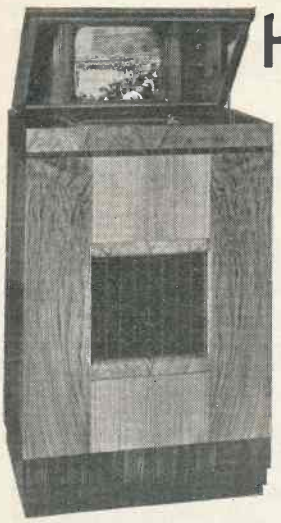
The somewhat unusual course adopted of feeding the modulator signals into the final H.F. amplifier stage is due to the band width of zero to two megacycles.

Television Exhibition at the Science Museum

As stated last month it is intended to hold a television exhibition at the Science Museum, South Kensington, which will open in the early summer. This will not be a commercial exhibition, but it will be designed to be of scientific and historical interest. The co-operation of the leading manufacturers has been secured and arrangements are now going forward. The precise opening date will be announced later, but it is expected that the exhibition will last from June to August.

An item of particular interest will be a model of Campbell Swinton's original suggestion for a cathode-ray system of television, which although at the time was not practicable, was so closely an anticipation of modern practice.

USEFUL HINTS ON OPERATING H.M.V. TELEVISION RECEIVERS



H.M.V. MODEL 901 RECEIVER.

ACCOMPANYING the instructions provided with the H.M.V. television receivers are some very useful diagrams which will enable the veriest novice to correct any fault in tuning or adjustment without the slightest difficulty. As these are of particular interest we have taken the liberty of reproducing them, and the accompanying text matter explaining how the several faults can be remedied. Actually in the H.M.V. instructions pointers are provided to a diagram of the actual controls of the receiver which still further facilitates their use.

In the H.M.V. receiver there are five main controls in addition to the on-off switch and also there are four pre-set controls; the latter, however, are not intended to be touched by the user and it is to the former to which the diagrams refer. The following are the instructions provided and the references to the diagrams will be clear. These instructions, it should be noted, are for the entire resetting of the usual controls and will not ordinarily be necessary after a picture has once been secured.

(1) Turn the brightness control fully to the left.

(2) Switch on the instrument.

(3) Turn the sensitivity control fully to the left.

(4) Turn the contrast control fully to the right.

(5) Slowly turn the brightness control to the right until a faint illumination appears on the screen. Then turn back until this just disappears.

(6) Turn the sensitivity control to the right until traces of the picture appear on the screen. Continue turning until a light and dark contrasting pattern appears on the screen.

(7) Now slowly turn the frame hold control until the pattern formed on the screen, which will be moving from top to bottom, or bottom to top of the screen, becomes stationary.

(8) Turn the line hold control until a steady recognisable picture appears.

To sum up:—

I.—To control the picture in a *horizontal plane*, i.e., from side to side, adjust the line hold control.

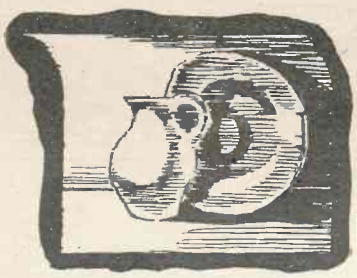
II.—To control the picture in a *vertical plane*, i.e., from top to bottom and bottom to top edges, adjust the frame hold control.

III.—If turning the line or frame hold controls slowly does not result in a steady picture, turn the control in question throughout its whole travel quickly and then recommence turning slowly.

IV.—If adjustment of the line and frame hold controls fails to stabilise the picture, slightly turn the vision input control a little further in a clockwise direction.

V.—Should the picture give the impression of two pictures, one imperfectly superimposed on the other, this indicates that the line hold control is badly out of adjustment. To rectify this, turn the control as far as possible to the right, turning back slowly until the picture properly synchronises.

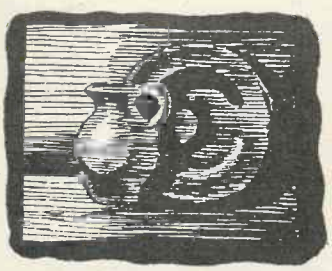
(9) Bring up the half-tones of the picture, if necessary, by manipulating the contrast control in conjunction with the brightness control.



ADJUST LINE HOLD & SENSITIVITY.

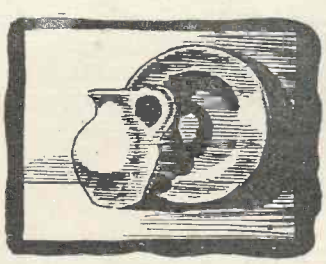
ADJUST LINE HOLD.

ADJUST FRAME HOLD.



ADJUST BRIGHTNESS and if necessary Contrast.

ADJUST CONTRAST and if necessary Brightness.



NORMAL.

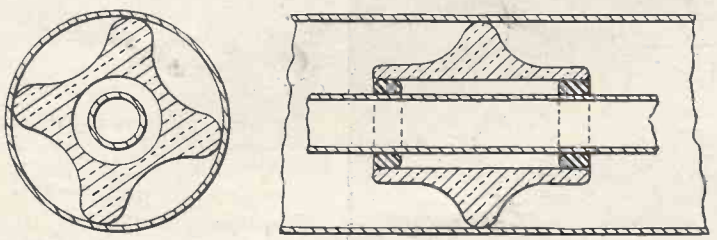
THE COAXIAL CABLE

By Kenneth Lake

A description of the construction and characteristics of the new high-frequency transmission line.

AS an inter-station link and means of relaying outdoor television, coaxial cables will play a very important part in the B.B.C.'s television broadcasts. The Post Office has connected Alexandra Park with Portland Place by means of a high-frequency cable of this type.

The construction of the air-spaced coaxial cable is very simple. Two coaxially arranged conductors, the inner of which is either a solid rod or a tube and the outer a tubular structure of conductive material concentric with the inner conductor, form the basic principle.



The original patent for a coaxial cable was applied for by C. S. Franklin on October 19, 1926. These drawings are from the complete specification filed on August 19, 1927.

The first patent taken out on this type of air-spaced cable was No. 284,005 the patentee being C. S. Franklin. In the description of his invention, he gives the ratio of inner to outer conductor as 3.7, and the sizes of conductors as:—

Outside diameter of the inner conductor $\frac{1}{2}$ in. material 24 s.w.g. copper.

Inside diameter of outer conductor $1\frac{3}{4}$ in. material 22 s.w.g. copper.

It is easily understandable that the difficulties of manufacturing this cable would be insurmountable, except in very short lengths, and the walls would collapse if any attempt was made to bend it.

Manufacturing difficulties that present themselves are the right type of spacer to use, and the material and form of construction the outside conductor will take. Regarding the spacer, there are two types in use to-day—the insulated washer and the continuous spiral of insulated material wound around the centre conductor. Of these two, the washer method is the most efficient as it enables long straight lengths of cable to be laid with just sufficient washers to keep it coaxial, thereby cutting down dielectric losses. The inner conductor presents few difficulties and here a solid copper rod is used; but for the outside conductor more flexible materials such as drawn copper or aluminium tapes or even lead are used.

In the Bell System Technical Journal of October, 1934, there is a description of an experimental cable laid in Phoœnixville, U.S.A., with a range of 100 kc. to 10,000 kc. This cable proved very successful, and to those interested, although it is highly technical, the Bell System article is well worth reading.

Measuring the Constants

The simplest method of measuring the primary constants of a coaxial cable is by loose coupling a Hartley or Colpitt oscillator to a known inductance and connecting in parallel a capacity and valve voltmeter. By tuning the capacity, it is possible to calculate the frequency generated by applying the formula

$$W^2 = \frac{1}{\sqrt{CL}}$$

By inserting the cable it is possible to measure capacity and inductance and by substituting a resistance to measure resistance.

The attentuation formula is given as:—

$$a = \frac{R}{2}\sqrt{\frac{C}{L}} + \frac{G}{2}\sqrt{\frac{L}{C}}$$

where R = resistance, L = inductance, C = capacity, G = Conductance. Experience has shown that attenuation is not seriously affected by a slight departure from ideal construction due to joints and lack of concentricity.

These larger types of coaxial cables and high-frequency air-space cables, unless as a matter of interest, are no use to the amateur experimenter, but there are now available many types of small efficiently screened lead-in and inter-connection cables. These cables are of a low-loss and low-capacity type, and useful in many ways to television, where screening is important.

One that the writer has in mind is made by the Telegraph Construction and Maintenance Co., Ltd., and has a 14/.0076-in. T.C. conductor encased in a gutta-percha compound which is drawn into a star shape to cut down dielectric loss. This is sheathed in an insulated tube which is in turn covered with a close braided screen. This is a very robust cable and tests in which four amps. were passed through it for four hours without a trace of dielectric softening have been made

There is still a wide field for research and improvement of this type of cable.

The A.R.R.L. Handbook, 1937 Edition

THE new "Amateur Handbook" issued by the American Radio Relay League consists of no less than 21 chapters, plus an index of miscellaneous practical information. Most of the important technical developments of the past year are embodied so that the book has been almost entirely re-written.

Special attention has been given to the development of noise silencers for short-wave receivers, the capabilities of new transmitting and receiving valves, and a wealth of constructional information.

Ultra high-frequency working has come in for a big share of the space.

Altogether there are 544 pages, including a 112 page catalogue section, plus 564 illustrations, 74 charts and 86 formulas.

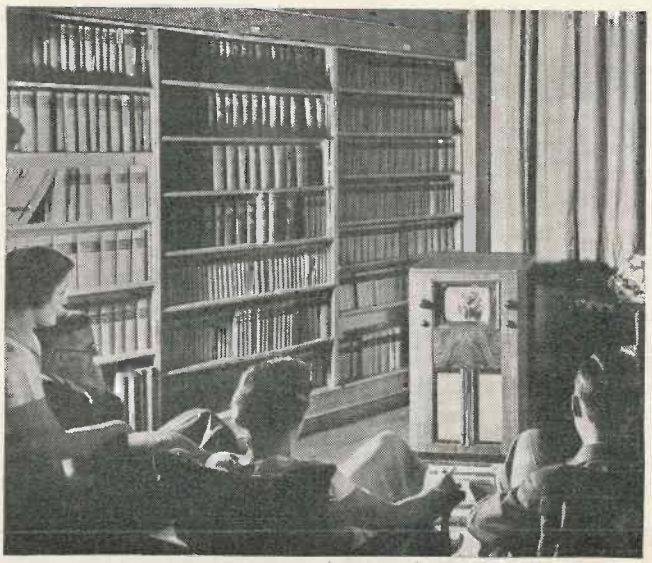
Copies of this Radio Amateur's Handbook can be obtained from F. L. Postlewaite, G5KA, 41 Kinfauns Road, Goodmayes, Ilford, Essex, post free, 5s. 6d.

SOME REFLECTIONS ON FOUR MONTHS' VIEWING

By the Editor

AFTER four months of reasonably consistent viewing of the television broadcasts one begins to form fairly settled opinions of the value of this new form of entertainment. After this period the real novelty of it has gone and one begins to take a keener interest in such matters as receiver performance, programme value and the reactions of one's friends.

The receiver which has been used is a G.E.C. and from the outset it was decided to keep a record of any inconsistencies of performance. Looking back over this period I find that their were five occasions when the programmes were marred in some way or could not be received. Two of these (one sound only) were due to faults at the transmitting station, one because, owing to a high wind one side of the feeder became detached from the aerial, and fourth and fifth because of some local interference which, although it did not affect the picture to any great extent, completely drowned the sound. This same interference has been experienced on other occasions but only for periods of a few minutes and therefore it was not considered worth while to go to much trouble in tracking it down.



The pictures can be viewed in subdued light. The receiver in use in this photograph is a G.E. C.

Absolutely Reliable

Throughout the whole of this period no internal adjustment or replacement of any kind has been made to the G.E.C. receiver and this provides proof that the modern television receiver is just as reliable as the average broadcast set. It is no secret that this proof of reliability which practical experience over the past few months has provided has been one of the factors which has enabled manufacturers to reduce their prices so very considerably. In the first place provision had to be made for servicing on a somewhat extensive scale, which is always an expensive matter, and particularly in the case of television receivers with which there had been no previous experience; but it has now become apparent to the makers that any extensive servicing with the consequent cost will not be required.

Reception conditions, during the time on which these notes are based, have varied, but in round figures it may be stated that they have been 90 per cent. good—that is for 90 per cent. of the total time of reception both vision and sound have left nothing to be desired. Naturally, when conditions are not at their best one tries what effect adjustment of the controls will have and sometimes an improvement has been effected, but generally speaking it has been found that on later transmissions and with the original settings everything has been quite satisfactory, which indicates that the transmission has been at fault or that there have been bad conditions. As a matter of fact, most of the trouble that has been experienced because of adverse conditions has been on the sound side, and it is this section of the receiver which is most affected by interference from car ignition systems.

Tuning

Tuning of the sound is far more critical than vision, in fact the picture is there within any limits of the single-knob tuning control, but the sound is critical to within a few degrees. This, of course, makes tuning as simple a matter as tuning an ordinary wireless set and it is possible for the veriest novice to receive the programmes. On the whole it has been found that in the case of the Marconi-E.M.I. transmissions the direct studio shots give better results than films and that on any of the rare occasions when there is any tendency for synchronism to be at all troublesome it is with the latter.

The results with different aerial arrangements were described in the January issue of TELEVISION AND SHORT-WAVE WORLD, but they may be summed up by saying that height is of paramount importance and that a reflector will be found beneficial at the outer limits of the range of the Alexandra Palace transmitter. Tests made with inferior aerial systems showed that a host of troubles could be introduced. I would say, therefore, erect the aerial in as high a position as possible and if on the limits of the 25 miles radius of the transmitter use a reflector. At distances of less than twenty miles a reflector should not be necessary.

Other People's Opinions

During the period that the receiver has been in use it has been interesting to observe the reactions and hear the criticisms of other people. One and all have expressed their amazement at the degree of technical perfection that has been attained. Clarity and detail have obviously exceeded their expectations, and the only technical criticism has been regarding the picture size.

It has been obvious that a large proportion of the programmes has failed to hold the interest of viewers, but it has been equally clear that when the material is good there is

THE FUTURE OF TELEVISION

plenty of entertainment value. The difference between the first-class artist and the third-rate type is very apparent on the television screen, and it is very clear how the audience reacts. The same remarks apply to productions; there have been some very amateurish attempts and some first-rate ones, and it has been observed that audiences are very quick to notice and criticise the former even to the point of ridicule. Such productions, and even poor artists, do definite harm to the progress of television and undoubtedly have been the cause of many potential buyers of receivers deciding to defer purchase until better entertainment is available.

Since the reduction in receiver prices, the previous common complaint that television is too costly is rarely heard; it appears to be appreciated that now the price represents full value, and when this has been discussed in comparison with the average broadcast set, it has been a matter of favourable comment.

The Importance of Good Programmes

It seems clear, therefore, that the popularising of television depends upon the quality and nature of the programmes and in this latter respect the consensus of opinion appears to be that it will be necessary for the B.B.C. to go outside the limitations of the Alexandra Palace for programme matter; it is too much to expect that studio programmes with 100 per cent. interest can be devised day after day. It has been noted that such outside items that it has been possible to give, as for instance the boxing match in February, have aroused more interest than the studio programmes. The extension of this branch of television broadcasting is dependent to some extent upon further technical development by the provision of suitable communication channels between various parts of London and the Alexandra Palace, a matter which is now under consideration by the B.B.C.

It has been interesting to learn the opinion of viewers who had previously witnessed demonstrations in public viewing rooms, but had not had the opportunity of seeing an entire programme through, and under ordinary home conditions. These people, it was found, were for the most part aware of the degree of technical perfection that has been attained, but had not appreciated what amount of entertainment value the programmes could carry, and it would appear therefore that these demonstrations, where viewers are only able to witness scraps for periods of about five minutes, are doing television a disservice.

Another point of interest has been the amount of ordinary room lighting which has been permissible when witnessing a transmission and it is one that is of considerable importance. Naturally, the picture is best seen in total darkness, but it has been apparent that subdued lighting, as for instance by means of a shaded table lamp, which will allow others to read, has very little detriment. It has also been found desirable to have the receiver in such a position that the programmes can be seen with as little disorganisation of ordinary seating accommodation as possible. This is not always easy for there is the light from the fire to take into consideration, and as this is likely to flicker it has a more detrimental effect on the pleasurable observance of the pictures than has a steady subdued light from an ordinary lamp. The ideal position for the television receiver screen would appear to be over the mantelpiece, a position which is not practicable at the present time but may ultimately be found possible.

These notes would be incomplete without some mention of the keenness of people to see the broadcasts. Obviously this may be because of the novelty of it all, but it indicates that the added value of sight to broadcasting has caught the public fancy and that the time will come when practically every home has a television receiver.

Book Review.

The Physics of Electron Tubes, by L. R. Koller, Ph.D. (Mc.Graw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2). This book deals with the behaviour of electrons in electron devices of all types. The objective of the author has been to describe the physical phenomena that goes on within these devices and not those which take place externally. Circuits, therefore, are not discussed and in this respect we believe the book to be unique. In this, the second edition of the book, the author has added notes on the most recent developments in electronics, including electron optics and the electron multiplier.

The contents include:—theory of thermionic emission, cathodes, secondary emission, getters and clean-up, space charge, electron tube types including the cathode-ray tube, photo-electricity, photo-conductivity and the photo-voltaic effect.

The importance of the book to the radio engineer lies in the succinct and clear explanations of the phenomena found in valve practice. The average worker does not want to extract his information from a mass of theoretical matter, however relevant, but he does want to know exactly what the " shot effect " is and how it differs from the Schottky effect. These and all the other phenomena peculiar to thermionics are described in just the right manner. The author points out the importance of grid emission in thyratrons—a point which is seldom appreciated. The note on the Geiger Müller counter conveys an accurate idea of this photo-electric device and the chapter on photovoltaic (photronic) cells is of interest in view of the increasing use of these units in measuring instruments. The book contains many references to literature dealing specifically with the items discussed and forms a valuable guide in this respect. In all it contains 234 pages; it is well illustrated and can be recommended. The price is 18s.

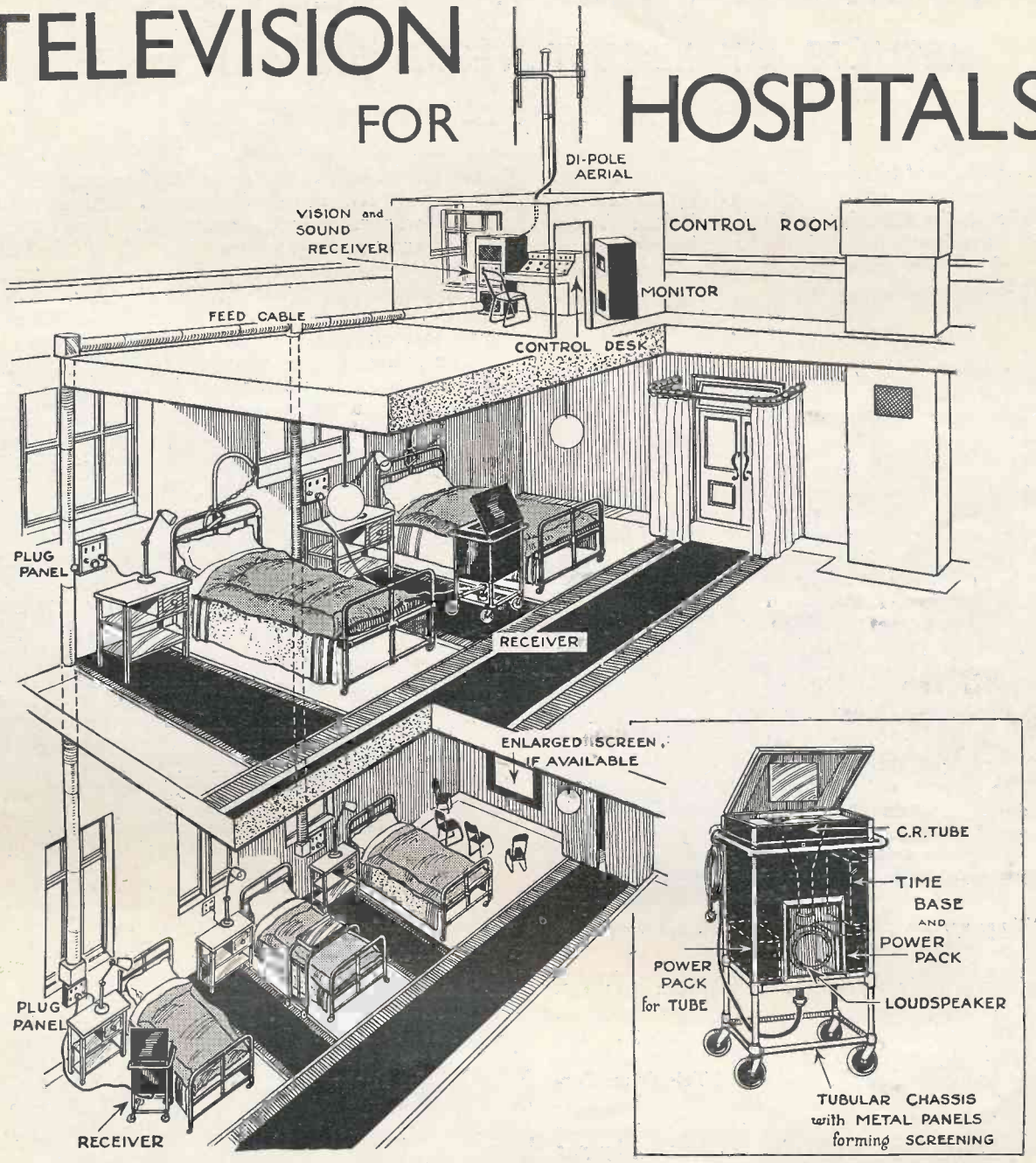
Television Lecture-Demonstrations.

Commencing on April 14, at 8 p.m., Mr. H. J. Barton-Chapple, B.Sc. (Hons., Lond.), A.C.G.I., D.I.C., A.M.I.E.E., will give the first of six lecture-demonstrations on television. The fee for the complete course is 5s., and the lecturer will cover such features as scanning methods, practical transmitting equipment, ultra-short waves, channels and filters, light modulation methods, synchronising, television receivers, installation problems, and many other points.

This course will be of interest to constructors, experimenters, and radio dealers interested in the installation and maintenance of modern television receivers.

Lectures are to be given at the Norwood Technical Institute, Knight's Hill, West Norwood, S.E.27, on April 14, 21, 28, and May 5, 19, and 26. Full details can be obtained from the Secretary, J. C. Anderson, at the above address.

TELEVISION FOR HOSPITALS



TELEVISION would appear to be an ideal form of entertainment to provide in Hospitals and the General Electric Company has already received many inquiries regarding the possibility of relay systems of television throughout a building from one central receiver.

In the case of radio installations in hospitals, one receiver is provided with relay lines to earphones at the patients' bedsides or, in some cases, (in convalescent wards) to a loud-speaker.

"Television distribution from a central point to a number of screens is quite feasible," said a G.E.C. technical expert. "It would be quite possible for a large hospital to have one screen in each ward operated from a central point. It would be necessary, however, to have a cathode-ray tube and loudspeaker for each reception point and a special mains unit to supply the necessary voltage.

"The only objection so far to the scheme is one of cost, but with the increasing demand for television it is likely that the price will shortly be within the reach of most big hospitals. Experimental work on this development is already being carried out in our laboratories

In the picture above our artist has depicted a scheme which would appear to be practicable. Owing to the size of the picture it would only be possible for one or two patients to view at the same time and on this account he has suggested a receiver mounted on a trolley which could be plugged in to points at the side of each bed. Actually this receiver would only contain the tube, time bases and power packs, the actual wireless receiver being in a central position and connected to each bedside point by means of a feeder.

PHILCO (U.S.A.) TELEVISION

RESULTS OF RECENT TESTS ON 441 LINES

BY OUR AMERICAN CORRESPONDENT

A SINGLE set of television standards for the U.S.A. has been proposed by the Television Committee of the Radio Manufacturers' Association. These standards have been endorsed by the active workers in the field of cathode-ray television, who have altered,

The Philco camera tube. P. J. Konkle, Philco television engineer, about to place the tube in the camera.

or are altering their equipment to conform to them. Among other things these standards specify an increase in the number of picture scanning lines to 441. The highest previously used was 345 lines.

Six months ago the Philco Radio and Television Corporation, at the close of a series of field tests in Philadelphia, invited the Press to witness a television demonstration at Rydal, when radio pictures scanned by 345 lines were shown. Their steadiness and clearness were commented on favourably. On this occasion it was announced that the transmitting and receiving equipment would be dismantled and rebuilt to operate as a 441-line system as recommended by the Television Committee.

First Broadcast of 441 Lines

Philco's improved 441-line system has been on the air for broadcast experiments since last December. During the first few weeks of these experiments, while initial adjustments were being carried out, picture quality steadily increased. It has now reached that stage of excellence where the effects of higher picture resolution are plainly evident to the observer. This is the system which was recently demonstrated. From the Philco visual broadcasting station, W3XE, a television programme was transmitted to invited guests gathered at the Germantown Cricket Club. A 6-megacycle radio channel was employed and the Philco engineers attribute part of their success to this wide channel.

The increase from 345 lines to 441 lines represents about a 30 per cent. increase in definition which possibly would not be noticed by the casual observer unless he was given an opportunity to compare the two pictures side by side. A test of this nature was arranged by the engineers as a part of the demonstration. By means of an electrical network, which could be switched in and out of the circuit at the transmitter, the resolution could be reduced (in one direction) so as to simulate that ordinarily secured with a 345-line system. Then, by a throw of the switch, the system could be quickly converted to 441 lines with maximum detail. The effect of thus increasing the definition was surprising. It was especially so when looking at objects on which there was small lettering, for instance, the serial number on a one dollar bill, or the second hand of a watch.

The higher definition produced a smoother, more pleasing picture, in which the line formation was not visible from the ordinary viewing distance.

A simple test chart was devised and used by the Philco engineers for this demonstration. It consisted of placing before the television camera a card on which was attached a one dollar bill, laid lengthwise. This was flanked on either end by similar bills, placed vertically, so that the width of the test chart was about 11½ ins. This area was completely scanned so that the three one dollar bills just filled the viewing frame from

A television fashion parade. Jeri La Porte shows the newest thing in bathing costumes at the Philco demonstration.

side to side. The test consisted of being able to read the serial number on the central bill and to make this legible it was found that a definition of 441 lines was necessary.

"HIS MASTER'S VOICE"

TELEVISION

Sight and Sound in your Home

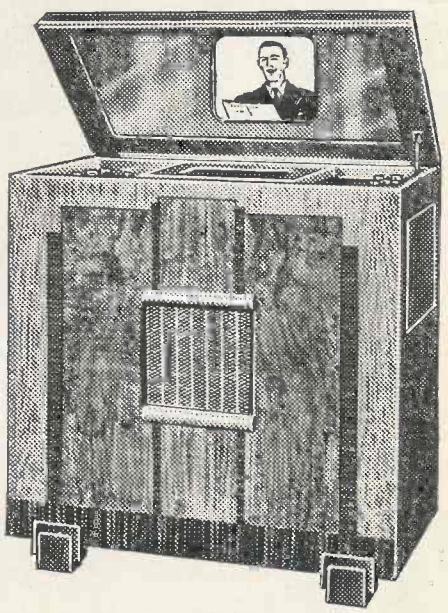
FOR £1 PER WEEK

NOW that the B.B.C., following the period of experiment, are televising pictures on one system only, "His Master's Voice" have increased greatly their plans for the production of Television sets for the home with consequent reductions in price.

You can choose from two instruments:—Model 900 at 80 gns. and Model 901 at 60 gns. including aerial, installation and FREE maintenance for one year. With the larger, 'Model 900,' you can enjoy in addition to the Television programmes, fascinating short wave radio reception from U.S.A. and other distant countries, besides those of Europe. The smaller, 'Model 901,' receives Television sound and sight programmes only, with the same excellence as the more expensive instrument.

Remember, "His Master's Voice" Television receivers are designed by the engineers responsible for the Television system now adopted by the B.B.C. at the Alexandra Palace—the one which, after tests, was agreed to be the finest in the world.

The Television pictures reproduced by a "His Master's Voice" receiver are exceptionally clear and brilliant, they may be viewed over a wide angle and it is not essential for the room lights to be extinguished. Think of the delight and pleasure a "His Master's Voice" Television receiver can bring to your home. Most families will have Television soon — get your set now and be the first among your friends to have the latest achievement of science.



Model 900 *(as illustrated)* "*H.M.V.*" *Television and All-World Radio. Cash Price* **80** *gns.*

Model 901 "*H.M.V.*" *Television Receiver. Cash Price* **60** *gns.*

IF YOU HAVE EVER MISSED A CALL SIGN OWING TO LOCAL INTERFERENCE, YOU NEED A "HIS MASTER'S VOICE"

Ask your Dealer for a Leaflet giving full particulars.

All-world *Anti-static* Aerial

Provides anti-static reception on all wavebands from 7–2,000 metres. Equipment consists of three lengths of stranded copper wire of 5, 39 and 60 ft., aerial and receiver transformers, heavy screened insulated lead-in cable and the necessary insulators.

Price **37/6**

Scannings and Reflections

TELEVISION AND THE HOME CONSTRUCTOR

FROM the number of letters which we have received from readers who have built the Guaranteed Cathode-ray Receiver described in our October, November and December, 1936, issues, it is abundantly clear that its construction has come well within the abilities of the average amateur who is conversant with the ordinary procedure of building a wireless set. In no case, so far as we are aware, has any real difficulty been encountered and we have received a number of letters commenting upon the excellent results that are being obtained. The actual work entailed in building this receiver is just as simple as building an ordinary wireless set and apart from the value of the finished instrument it provides an insight into television receiver construction which could not be obtained so easily in any other way. To dealers and service men who contemplate taking up the sale and servicing of television receivers this is a point which is well worth bearing in mind, for the experience gained will be a valuable asset in the future.

REAL LONG-DISTANCE TELEVISION

According to the *Sunday Graphic* radio correspondent, the Alexandra Palace vision transmissions have been received and a picture seen in New York. The statement says that "an expert of the National Broadcasting Company of America was the man who 'saw' London 3,000 miles away. This was on February 23, and the B.B.C. has received the news officially." Even though this report be true it by no means follows that transatlantic television will become a possibility in the near future, though it should be noted that the officially stated service range of the Palace transmissions (25 miles) is a very conservative one. The reliable limit at present under suitable conditions appears to be about 60 miles, though in certain instances even this has been exceeded.

INCREASED TRANSMITTING TIME

It is practically certain that the immediate future will see an extension of transmitting time. This question is now under consideration, and it is probable that at first there will be an increase of one hour each day. It is generally conceded that the one-hour sessions are sufficiently long, so the additional hour will therefore form another session, probably in the early evening. One advantage of an early evening transmission would be that dealers could demonstrate receivers to prospective customers who cannot well make it convenient to attend the afternoon demonstrations.

DEVELOPMENTS IN FRANCE

The French Government are about to institute a series of comparative tests of different television systems with the object of deciding upon the most suitable and determining an actual standard. These tests are to be made through the intermediary of the present Eiffel Tower station and it is expected that a decision will be reached about July or August of the present year. The desirability of transmitting the accompanying sound on short waves, instead of on medium as is done with the present Eiffel Tower transmissions, has been urged and that the standard adopted should be for a period of two to three years.

THE TELEVISION SOCIETY AND RESEARCH

Projects are now under discussion by the Council of the Television Society which it is hoped will result in the acquisition of premises centrally situated in London, which will form a research centre. It will then be possible to provide members with a reference library and facilities for experimental work, and in addition a demonstration receiver. It is hoped that this scheme will be possible at an early date.

Membership of the Society improved during 1936, the active membership being 354, against 354 at the end of December, 1935.

TELEVISION IN AUSTRALIA

It is reported that some Australian theatrical interests have acquired the licence rights of a German television system and intend to inaugurate a service. A privately-owned low-definition system has been experimented with during the past year or so in Australia.

SCREEN STAR AT DON LEE DEMONSTRATION

The popular screen star, Robert Montgomery, and Mrs. Montgomery were among the party of picture notables to attend a recent demonstration of television as developed by the Don Lee Broadcasting System in Los Angeles, U.S.A. Film images were broadcast from W6XAO, sound from KHJ, the two being synchronised at the receiver.

Mr. Montgomery evinced deep interest in the system employed and inquired as to the lighting and technique of making motion pictures for television purposes. "I am surprised at the results," commented the well-known star. "The present exhibition is a great advance."

NEW BRITISH CALL SIGNS

For the past few weeks a few of the GM British call signs have been heard on the air and these have caused a little confusion amongst foreign listeners who are not aware of the identity of these stations. At the request of the Radio Society of Great Britain, the Post Office have allocated to all Scottish stations the prefix of GM followed by a number and two letters. This brings Scotland into line with Northern Ireland, which has the prefix of GI. Foreign listeners should note that in future any station with the call sign of G, GM or GI is situated within the British Isles. EI is still retained by the Irish Free State; so far, no special call sign has been allocated to Wales.

RUSSIAN TELEVISION CONFERENCE

The first conference regarding the future development of television in Russia took place at Moscow on

MORE SCANNINGS . . . . . .

January 19. It has been decided to institute the first service in that city and equipment for this has already been ordered from the United States, which is expected to be delivered in April. Another station is to be provided in Leningrad and equipment for this is being made in Soviet factories. It is also planned to build a third transmitter in Kiev. Arrangements are being made in Moscow to transmit from the sports stadiums and the public squares.

BROADCASTING TELEVISION SOUND

The suitability of certain material of the television programmes for ordinary sound broadcasts is not being overlooked by the B.B.C. and the first transmission of this nature will be made on April 7. Obviously not all television programmes could be used in this way, but in many cases it is practicable to design them so that the sound transmission is suitable for the National and Regional listeners and, presumably, an economy will be effected.

BROADCASTING ON 9 METRES

Although it was considered that 13 metres was the lowest limit on which commercial broadcasters could radiate reliable programmes over a large area, the tests by the Milwaukee, Wisconcin 9-metre station have proved the contrary. This station is radiating the N.B.C. medium-wave programme and when conditions are so bad that the normal 13-, 16- and 19-metre stations are unreceivable, this 9-metre transmitter is receivable in England at great strength.

The 13-metre commercial stations are generally unreceivable after dark, but so far, Milwaukee, W9XAZ, is a steady and reliable signal at all times of the day.

REHEARSALS AT A.P.

Rehearsals of the television programmes are conducted upon almost identically the same lines as the actual transmissions. The flood lights are on and the cameras in operation, the results being observed in the monitor receivers, in fact, the only difference is that the transmitter is operated on a closed circuit so that it is not actually on the air. Apart from actual rehearsals of the artists a good deal of experimental work is carried out at all times with such matters as lighting, super-imposition, etc.

TELEVISION INQUIRY BUREAU

The reduction in prices of television receivers has aroused a great deal of public interest and, as a result, the G.E.C. has opened an information bureau at Magnet House, Kingsway, where any questions relating to television are answered either personally or by letter.

"Since the reduction in the price of television receivers, inquiries from both the trade and the public have increased," said Mr. D. Murdoch, who is in charge of the bureau. "The most frequent inquiries are from the public to know if they are in the reception area. From our experience of installing sets up to fifty miles of Alexandra Palace, we are able to give them detailed information."

"We have discovered, rather surprisingly, that many misapprehensions about television still exist. A lady rang up recently to ask what size of screen it was necessary to have in the drawing room; another inquirer thought that television provided still pictures like a magic lantern.

"We have also received many inquiries on transmission from the trade, which are dealt with by the technical staff."

Mr. Murdoch also said that the use of only one system of transmission had made the selling of television receivers an easier task. Formerly, when two systems were used in alternative weeks, the prospective buyer had to pay two visits in order to see the set working with both methods. Now one visit was sufficient.

MINE HOST AND TELEVISION

Among recent purchasers of television receivers are large numbers of owners of licensed premises who are finding them a profitable attraction. It is stated that this class are at present the largest purchasers and that the number of receivers in public houses now exceeds those in the large departmental stores.

REFLECTING ULTRA-HIGH FREQUENCY WAVES

Mr. Watson Watt, of the National Physical Laboratory, claims to have proved the existence of a third ionised layer only a few miles above the earth's surface. The reception of ultra-short wave signals in Cape Town and America is claimed to be due to the fact that these short wavelengths are being reflected by this newly-discovered layer.

No data is available as to the reliability of the reflected waves, or approximately where the ultra-short wave signals are likely to be received, but reports have come to hand which indicate that reception of 5- and 7-metre signals in distant parts of the world is quite possible and that there is no need further to foster the idea that these wavelengths are quasi-optical.

INTERNATIONAL VALVES

The introduction of a range of 6.3-volt heater valves with octal bases by the General Electric and Marconi Companies is considered as long overdue by most amateurs. Apparently, it is intended that these valves be interchangeable with American valves in the octal glass ranges.

A complete range has been introduced, all of which have a medium slope, so allowing for generous inter-electrode clearances, giving increased reliability and consistency. Owing to the 6.3-volt heaters these valves are suitable for use in A.C., D.C., A.C./D.C. and car radio receivers, for the low current makes them suitable for series heater running.

Apart from self-locating octal bases so that all valves use the same 8-pin valve-holder, there are several valves of interesting types. A double diode with separate cathode connections is ideal for noise suppression and A.V.C. circuits, while constructors will now be able to build high output amplifiers with low voltage by using the N66 tetrode, which uses the aligned grid technique generally known as "Beam" valve.

One effect of these new valves is that domestic receivers may all be rated to give 8 watts output for one of these "Beam" valves in a standard circuit with 250 volts H.T. is so rated.

O.B. TELEVISION

Arrangements for televising the Coronation procession are going ahead and a start has already been made with the laying of the co-axial cable, which will bring the television signals from various points of the route to Broadcasting House from where they will be sent over the existing cable to the Alexandra Palace. The first intention is that the cable shall tap various points in the Piccadilly and Westminster dis-

. . . . AND MORE REFLECTIONS

tricts and that later it shall embrace the whole of the West End. The Regent Street section is now in process of being laid. As with the London-Birmingham cable this is not intended entirely for television, but it is expected that it will be possible to use it for this purpose and enable various centres of entertainment in the West End to be tapped.

Work is also being pushed on with the outside transmitting equipment, and when this is ready it should do much to extend the scope of the programmes. The complete equipment will be contained in three vans —one for the transmitter, another for the scanning gear, and the third for power supplies, and, of course, it will be necessary for these to work in conjunction with each other.

A POST OFFICE TELEVISION TRANSMITTER

In order to test the coaxial cables which the Post Office authorities have laid, or are laying, a television film transmitter has been ordered. The first of these cables was laid between London and Birmingham and extensions of this are now being made to Leeds and Newcastle-on-Tyne. The transmitter, which has been ordered will be capable of a much higher definition than the standard employed at the Alexandra Palace; as a matter of fact, it is intended to nearly double that. It appears within the bounds of possibility that initial experiments will be conducted for the installation of a visual telephone system between certain centres.

ANOTHER COAXIAL CABLE

Most of our readers know of the existence of a special cable between Alexandra Palace and Broadcasting House specially laid for television. Well, now a second cable is being laid, this time by Messrs. Siemens, according to the name on the large drums, while the words Television Cable also appears. This second cable is, by the way, designed by the E.M.I. group and is, we understand, " the goods."

ON A SHORT-WAVE

Listeners were surprised to hear a string orchestra recently from a B.B.C. station between 9 and 10 in the morning, while a short-wave experimenter heard the same music from the Palace sound transmitter. This is not the first time the normal Regional transmitter and the short-wave sound transmitter at the Palace have radiated the same programme. We fancy it is the beginning of a short-wave Regional scheme, which has two major advantages at least—high fidelity and not easily jammed by a hostile power in time of war.

LIGHTS OUT

During one evening transmission the announcer apologised for an interval owing to all the lights failing in the dressing rooms, etc. The situation was made even more difficult, we understand, as the artists about to go on did not understand English. Failure of lights reminds us that at Broadcasting House there is an emergency supply always available from a large storage battery; also, there is a standby generating plant, should the mains fail. No such provision has been made at the Palace. Mains supply are getting so reliable that the tendency of the B.B.C. is to do away with local generators and new stations are tending to be " all mains."

"Transformers for Television Scanning"

(*Continued from page* 210)

In Fig. 5 is given a curve of the variation of permeability of this alloy with frequency up to 200,000 cycles and it will be noted that there is only a slight reduction over this range. A silicon iron sample tested having similar initial permeability at low frequencies shows very poor properties at 200,000 cycles, its permeability there being less than 100. The Rhometal curve given applies to very thin tape which is rather expensive, but in commercial television receivers laminations are generally employed having a thickness of 0.008 in. To prevent misapprehension and assist designers, the effective permeability in the above curve is given by the formula:—

$$\mu = \frac{Ll \times 10^9}{4\pi N^2 A}$$

where μ = effective permeability
L = inductance of wound sample in henries.
N = turns.
A = mean sectional area of sample. cm.^{2}.
l = mean magnetic path of sample. cm.

Example of Design.

In one case a transformer having a primary inductance of 0.8 henry was desired for a particuluar receiver and laminations of the type illustrated in Fig. .6 in Rhometal 0.008 in. thick were selected. A core consisting of 54 such laminations has a mean sectional area of 1.3 cm.^{2} and a magnetic length, indicated by dotted line in Fig. 6, of 9.8 cms. The effective permeability was assumed to be 1,000 and the primary turns were derived as follows:—

$$N^2 = \frac{Ll \times 10^9}{4\pi A\mu} = \frac{0.8 \times 9.8 \times 10^9}{4\pi \times 1.3 \times 10^3} = 4.8 \times 10^5$$

whence N (primary turns) = 690.

These turns were wound honeycomb fashion and the transformer fitted with a suitable secondary similarly wound. The laminations had previously been spray-varnished with a very thin coating to prevent eddy currents, although sometimes the usual oxide coating is considered adequate.

Where low impedance magnetic deflection coils are employed the question of coil capacity and honeycomb winding is much less acute. On a practical test this transformer proved quite effective and much superior to another with a silicon iron core and suitable windings. The circuit incorporating the transformer is given in Fig. 7.

It might here be mentioned that by varying the heat treatment of the Rhometal it is possible to obtain (at low frequencies) values of initial permeability which vary from about 250 to 2,000. In general the least variation of permeability with frequency occurs with the samples treated for low permeability, but television receiver designers have to consider costing economics and a high permeability treatment is normally specified. On test, transformers with Rhometal cores prove to have a fly-back time several micro seconds better than those employing the more common magnetic alloys and obviously this must tend towards the improvement of definition of television reception.

PROGRAMME IDEAS AND CRITICISM

In our February and March issues we asked for criticism of and suggestions for improving the television programmes. We have to confess that, while the letters we have received are interesting, our correspondents have failed as a body to put forward many ideas that are really helpful at the present time, the amount of constructive criticism being relatively small. The letter which in our opinion contains the most useful suggestions is the one printed on this page and a cheque for two guineas has been sent to the writer.

THE IDEAL PROGRAMME

Television, so far as the B.B.C. is concerned, can only be successful if it brings into the home entertainment and instruction which cannot be obtained, or only with difficulty obtained, in any other way.

There would seem to be a wealth of suitable material and some striking successes have already been put over. Choice is, however, severely limited by technical considerations, the chief of which is the small size of the viewing screen.

Generally speaking, the most successful items in the past have been those which could be presented as "close-ups" or in which a great deal of detail is not necessary for enjoyment. Amongst the latter may be cited scenes from plays, duologues, double or single dancing acts, most juggling acts and feats of bodily dexterity. It has been noticeable that Mr. Seth-Smith has been most successful when he has shown the larger animals. It may also be pointed out that the close-up or semi-close-up may be exploited to the detriment of the performance. The very beautiful balancing act of Marion and Irma is a case in point. In its last presentation it was badly spoiled because for the greater part of the time only portions of the two contortionists could be seen. In such acts it must be the whole picture or nothing.

The construction of an ideal programme is a difficult matter since each individual has his own ideas and the B.B.C. must cater for everybody. Personally, I should like to be assured of scenes from a current play at least once a week, scenes from Shakespeare's plays at least twice a month, half an hour of variety four times a week and not less than four topical or instructional lectures or demonstrations each week.

INSTRUCTIONAL

With regard to instructional matter, the programme staff has not so far been very successful. The choice of topics has been good, but the technical equipment available both in the studio and in the home is not yet equal to the showing of pictures, diagrams and very small objects. Again we are confronted with the problem of deciding how much detail is required for intelligibility and how much can be sent. This can only be determined by experiment and, obviously, adverse criticism must not be made on purely experimental items.

REPETITIONS

The repetition of programmes in the past has been due to the lack of space and time for rehearsal due primarily to the necessity for working with two entirely separate transmitting systems. Now that one system has been decided upon repetition should be reduced to the bare minimum. It does not affect the casual viewer, but it is irritating to those who have installed receiving apparatus. Doubtless, repetition will be necessary for some time to come and I suggest that if the programmes are extended to three hours a day, the items from the first hour could very well be duplicated in the other two, but that the two later hours should be as different as possible from one another.

The present programme lasts from 9.00 to 10.00, occupies a very suitable hour, and in view of the extension of daylight with summer time, it could well be made the main programme of the day. The first programme could be either in the morning or the afternoon, but it would seem to be well if there was also a transmission between 6.00 and 7.00 or 6.30 and 7.30 p.m.

DURATION

With regard to the duration of transmission, one hour seems to be long enough for a sitting. The length of time of individual items depends, of course, on their interest, but, generally speaking, no single item should occupy more than a quarter of an hour. Instrumental soloists and vocalists go down better if they do not present more than one item at a time.

Films, in my opinion, are not generally suitable for television reception. Usually, they contain far too much detail for enjoyment on the small screen and they challenge comparison with the cinema theatre, which is most undesirable. The repetition of films day after day throughout the week is boring and irritating. The news-reels are below B.B.C. standards of presentation and should be discontinued.

The question of news is a difficult one. Obviously, news pictures should form part of the television programme and they must, of course, be film shots. I suggest that the presentation of news be confined to matters of real interest and importance and chiefly to things happening in this country. The outside broadcast vans will help when they are ready.

Bearing in mind that every hour's work at the Alexandra Palace is an experiment and that it is impossible to tell the result of any item until it has gone out, the Alexandra Palace staff is to be congratulated. We shall probably never know the full history of the hectic hours of apprehension that have been passed by the programme and technical staffs during the last few months. It is obvious that Mr. Cock is aiming at the intimate item and along that line success is likely to be obtained.

E. H. Robinson (Pirbright).

More Programme Suggestions

ENTERTAINMENT THAT THE CINEMA DOES NOT GIVE

Sir,

I look at the television programmes in the same way that I regard the sound broadcasting—an entertainment to be enjoyed occasionally with due regard for what one wishes to see and hear.

When a child has a new toy he plays with it continually until he wearies from a surfeit, and I think that lookers are in danger of falling into the same error. One cannot switch on a television set day in and day out and expect to be always entertained by something new. Once the novelty has worn off the programmes will be considered in their true perspective and we shall choose our visual entertainment like we choose the film that we go to see at the cinema.

You state that it is useless to draw a comparison between the cinema and television, but how can we do otherwise? It is familiar to all of us and represents a known standard of achievement. We can only compare television with what we already know in a similar form and it is inevitable that to the lay mind the living picture suffers in comparison because it is unable to differentiate between the real thing and the photographed record.

In the writer's experience it is the most difficult thing in the world to convince an audience that they are looking at an actual scene happening in front of their eyes, so deeply is the cinema instinct ingrained in the average looker.

This being so, the B.B.C. should accept the inevitable and attempt to give entertainment and instruction of a kind that the cinema does not give or does not think it worth while giving.

EDUCATIONAL

On the entertainment side Mr. Cock has laid his plans and they cannot be well improved, subject to the limitations of time, money and personnel. On the educational side the television programme can be the means of bringing hundreds of novel features to the public. Every week in London dozens of popular and scientific lectures are being given. Let the B.B.C. reproduce them, experiments and all, and let us hear and see Sir William Bragg and Sir Oliver Lodge expounding their classical theories. How much more fascinating would Sir Walford Davies be if we could see a close-up of his hands as he picked out melodies.

To many people the museums are closed at the only time when they are at liberty to enjoy them. Take viewers round a small part of one of the famous collections—surely the museum authorities would allow their priceless exhibits to be out of their charge for one or two hours?

What about a series of "How it works," on the lines of the book that delighted our schooldays. We have not lost our interest in things mechanical and here is a chance to have them explained by men who have spent their time developing them.

There is little point in pursuing this idea in further detail—Mr. Cock has shown how willing he is to adopt suggestions, and if the above have given him a faint clue to a means of adding to our entertainment and education, the writer will feel flattered.

To other lookers—don't crab the efforts of the B.B.C. too much. It is so easy to be hypercritical at this stage, and if television had been first on the scene, think how the cinema would be despised as a poor imitation of the real thing.

C. Mack (London, N.21).

THE CINEMA COMPARISON

Sir,

While generally admitted that television production must develop its own technique, it is not possible to avoid comparison with the cinema any more than early broadcasting escaped in this way from the gramophone; that broadcasting quickly equalled and to-day is substantially better than recorded sound is a helpful augury for the future of television. In any case, the public will not follow a new idea unless it can be, in its early stages, related to some older experience; that is a hard fact all pioneers have to face.

The successful artist will soon have learnt that his appeal must be to the individual viewer—the man in the armchair comfort of his home; the pianist, figuratively, will be playing in a drawing room to his friends and not to a concert hall audience, and as symbolised by the announcer's simple, "Thank you." Unfortunately, ordinary broadcasting has led us to appreciate music as such and to forget the mechanical production of sound. To the engineer a view of the control instruments might conceivably give as much pleasure as the picture of a row of violinists. We have, in fact, become more in sympathy with the composer than the virtuoso; however, we can even at this stage, enjoy the picture of a man extracting music from an ordinary rubber balloon; the viewer has to develop his capacity to be entertained no less than the authority who attempts to amuse him. A new medium demands a new outlook, perhaps extending eventually to the derivation of pleasure from some abstract presentation of geometric forms and changing patterns. One must remember what the Chinaman thought of Wagner and what we think of "native" music. Shall we have patience to learn?—I wonder.

When it comes to picturisation of *events*—which classification applies to public performances of music or drama—we are on safer ground and have little to teach the news reel; at the moment a film is for most purposes as useful as the original, *except* the sound portion. Skilled commentators at the studio could, perhaps, replace the sound track. I am sure no one will hold a brief for the second reproduction of news reel "music."

Gerald Sayers (Ware).

A FILM LIBRARY

Sir,

Every year outstanding pictures are produced. After a time these pictures are of no further value to the industry.

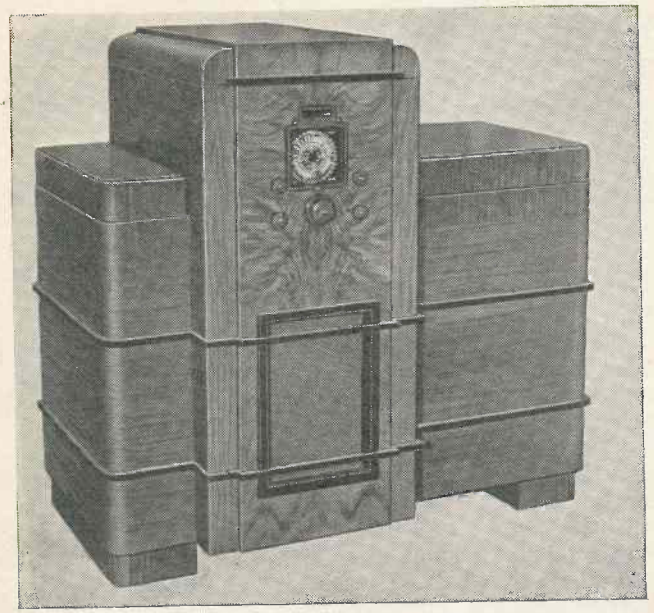
If the B.B.C. could acquire the master negatives of such films, they would in time have a very valuable collection of film masterpieces.

C. Grossmith (London, S.W.).

If space permits we hope to publish next month some further letters which have been received.—Ed.

PYE TELECEIVERS

A technical description of the Pye range of television receivers, comprising Model 4042 television and medium and long wave sound ; model 4043, television and all-wave radiogram ; and model 4044, television and all-wave console.



This is a photograph of the Model 4043 television and all-wave radiogram.

PYE RADIO, LTD., have produced three types of television receiver which differ only as regards cabinet arrangements and the sound channels. An all-wave sound channel is standard to two of the models and covers the four broadcast wavebands in addition to the 7-metre sound transmission. Of these two models, one is a radiogram fitted with automatic record changer. The third model has a sound channel covering the medium and long waves only. The model numbers are 4042 for the console Teleceiver with medium- and long-wave sound channel, 4043 for all-wave radiogram model and 4044 for the all-wave console Teleceiver.

In each case four units are employed for the reception of the television programmes:—(1) Vision receiver, (2) double time base and separator stage, (3) power pack and cathode-ray tube unit, (4) 7-metre sound receiver.

The vision receiver is a super-het and comprises a radio-frequency stage employing a TSP4 valve, followed by a frequency changer type AC/TH1 and four bandpass intermediate frequency amplifiers. These operate at a frequency of 7.5 mc. and consist of three TSP4 valves and a high efficiency power pentode valve N43; all stages have an approximate band width of 4 mc. The output from the N43 is fed to two D42 single diode valves working in a voltage-doubler circuit, which passes through a 2-mc. filter, the picture modulating voltage to the shield and first anode of the cathode-ray tube together with the D.C. component which controls the average brightness of the picture. The output from the two D42 valves is also taken to the synch. separator stages.

The Time Base and Synchronising Stages

This unit is divided into three sections (a) the line scan generator, (b) the frame scan generator, (c) the synchronising stage.

The line scan generator consists of three triode valves; two (an AC2/HL and a 41MXP) comprise a relaxation oscillator which gives a linear sawtooth waveform at 10,000 c.p.s. These are followed by a further 41MXP valve as an amplifier to give the necessary 800 volts output to the deflector plates of the cathode-ray tube—electrostatic deflection being used.

The frame scan generator gives a linear saw tooth output, again of approximately 800 volts, at 50 frames per second. A T31 Thyratron is used, and this is followed by a Pen4vA valve which is choke fed to a magnetic yoke placed round the neck of the cathode-ray tube.

Two TSP4 high-frequency pentode valves and a single diode D42 valve are used in the synchronising stage to separate the synchronising pulses from the picture signal, and pass same to their respective time bases. The two TSP4 valves are fed in parallel from the output of the vision channel unit, and their operating characteristics are so adjusted that all picture signal or noise are eliminated and only the synchronising pulses fed to the time bases. The output from one TSP4 synchronises the line scan generator, whilst that from the other, in conjunction with the D42 diode valve, synchronises the frame scan generator.

The Power Pack and Cathode-ray Tube Unit

The power unit comprises the cathode-ray tube supply and control unit, and the high tension or filament supply to the double time base and synch. separator stages and the vision channel unit.

The power supply to the cathode-ray tube consists of an indirectly-heated half-wave rectifier which delivers after smoothing approximately 4,000 volts. The voltages for shield, first and second anodes are tapped off from a potentiometer strip across this supply; each is variable within limits. The filament voltage for the cathode-ray tube, which is indirectly heated, is adjusted by a small variable resistance to the 2 volts required.

Two indirectly-heated full-wave rectifiers, each connected as half-wave, supply 420 volts at 200 ma. to the time base and vision channel units. The heater supply for these two units is from a common L.T. winding on the same transformer.

An Ediswan 12H cathode-ray tube is used in a vertical position, the picture being viewed in a mirror set at an angle of 45°, and a black and white picture is obtained 10 ins. by 8 ins.

The 7-metre Sound Unit

An ultra-short wave super-het adaptor is used for the sound and this consists of an X41 frequency changer followed by two VP4B valves as band-pass I.F. amplifiers operating at 1.45 mc. and adjusted to give an approximate band width of 150 kc. The output from the second I.F. stage is fed to a double diode valve 2D4A, which in turn feeds the L.F.

(*Continued at foot of page 219*)

TELEVISION AND SHORT-WAVE WORLD

PHOTO-ELECTRIC EFFECTS

A COMPLETE SUMMARY OF THE MOST IMPORTANT DEVELOPMENTS — PART I. — PHOTO-CONDUCTIVITY

By G. Windred.

This article provides an exhaustive review of the literature on photo-electric effects. It is intended primarily as a guide to published knowledge of the subject and gives particular attention to points of special importance.

THE branch of electrical theory represented by the various photo-electric effects is one of the most recent and at the same time most important additions to science. It has given rise to the sound film and television industries, and thus has a very real practical importance.

As in the case of most other scientific developments, the major facts relating to photo-electricity and its associated phenomena have resulted from purely theoretical research, carried out for the furtherance of knowledge as distinct from industrial progress. The greater part of this research has taken place in university laboratories, where the combined efforts of a very large number of investigators have gradually built up the bulk of present-day knowledge of the subject.

Classification of Photo-electric Effects

It will be desirable firstly to classify the various phenomena which may be regarded as photo-electric. Strictly speaking, the term photo-electric should be applied only to the phenomenon dealing with the emission of electrons from a substance under the action of incident light. The German term for this action is *äusserer lichtelektrische effekt* (external photo-electric effect), which describes very well the nature of the effect, and distinguishes it from the *innerer lichtempfindliche effekt* (internal photosensitive effect) relating to the change of electrical resistance of a conductor with changes of incident light. This latter phenomenon is known as photo-conductivity, and differs entirely from photo-electricity.

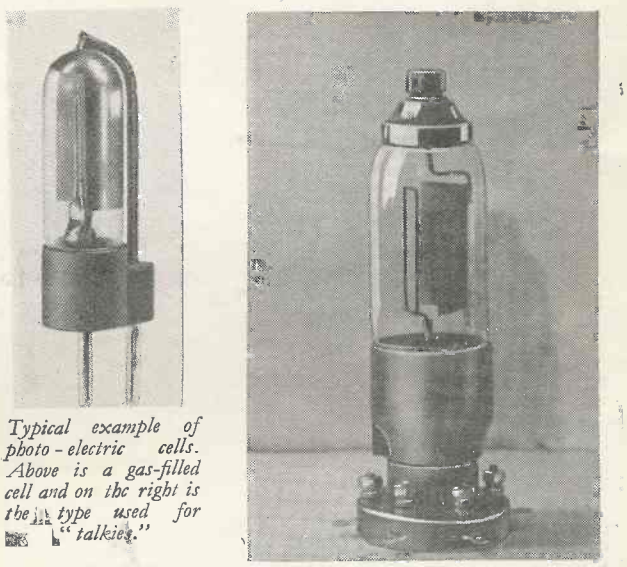
Another phenomenon of this class is the Becquerel effect, which relates to the production of an e.m.f. in an electrolytic cell of special form when subjected to illumination. The practical use of this effect is at present very limted.

A further and more recent development is based upon the fact that a suitably arranged copper oxide rectifier can be made to produce a current when illuminated under suitable conditions. A modification of this arrangement, developed in Germany as the *Sperrschicht Photozelle* (Barrier-plane photo-cell) forms an important addition to the range of photosensitive devices which may be used for translating variations of illumination into variations of electric current.

Photo-conductivity

The photo-conductive effect is best shown by the element selenium, which was discovered by the famous chemist Jons Jakob Berzelius as an impurity in sulphuric acid in 1817* at Gripsholm, in Sweden. The substance derives its name from the Greek Σεληγη (the moon) on account of its affinities with tellurium (Latin, *tellus*, the earth) which had been discovered a short time previously. There are three different forms† of selenium, as follows:—

1. Amorphous (*i.e.*, having no definite chemical structure), vitreous, and colloidal (*i.e.*, uncrystallisable), soluble in carbon bisulphide. These alternative types differ in appearance, but belong to the same class, sometimes referred to as liquid selenium.



Typical example of photo-electric cells. Above is a gas-filled cell and on the right is the type used for "talkies."

2. Red crystalline, occurring in two distinct forms, and soluble in carbon bisulphide.

3. Metallic, the most important from the present viewpoint, insoluble in carbon bisulphide, electrically conducting and light-sensitive; the effect of increase of incident light being to increase its electrical conductivity (*i.e.*, reduce its resistance). The last effect is best shown when a granular crystalline structure has been imparted to the substance by treatment at high temperature for some time.

The photo-conductive effect was discovered accidentally in 1872 by Willoughby Smith and his assistant May in the course of experimental work on submarine cables at Valentia Island. In connection with this work some sticks of crystalline selenium were being used as resistances, and were left lying in the sun. It was noticed that their resistance changed considerably from time to time, and that these changes coincided with

* Schweigger's Journal, 23, pp. 309, 430; Pogg, Annal., 7, 1826, p. 242; *ibid.*, 8, 1826, p. 423.

† Saunders gives a bibliography of the subject in T. Phys. Chem., 4, 1900, p. 423.

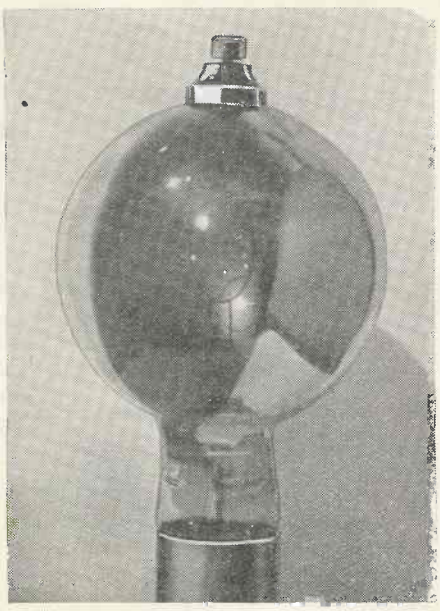
THEORY OF PHOTO-CONDUCTIVITY

changes of sunlight intensity. The observation was reported* to the Society of Telegraph Engineers (now the Institution of Electrical Engineers) and naturally gave rise to a considerable amount of research on the subject. It is, however, only during recent years that the use of selenium as a photo-sensitive substance has been at all extensive in practice.

The principal properties of selenium are as follows:—

Atomic weight, 79.2.
Melting point, 220° C., approx.
Boiling point, 690° C., approx.
Specific heat (crystalline), 0.084.
(amorphous), 0.095.
Linear expansion (crystalline), 4.9×10^{-5}.
Specific resistance (crystalline), 70,000 ohms per cm. cube.

If the last figure be compared with the specific resistance of copper, 1.7×10^{-6} ohms, it will be noted that the resistance of crystalline selenium is some 4×10^{10}, *i.e.*, forty thousand million, times as great;



An Oxford photo-cell pecially designed for television.

showing that the currents obtained are minute in relation to ordinary electrical practice.

The practical possibilities of selenium were realised as long ago as 1876 by W. Siemens, who made the first definite experiments with selenium "cells." Similar cells were also developed by Sabine (1878), Bidwell (1880), Graham Bell (1880), Mercadier (1881), Fritts (1880), Righi (1888), Liesegang (1890), Minchin (1895), Ruhmer (1902), and others.†

One of the earliest and most interesting applications of selenium cells was in connection with astronomy, where the measurement of the small luminous intensities of stars is of considerable importance. At an early date d'Albe* measured the light from distant stars, and concluded that with the use of a telescope and an ordinary selenium cell it is possible to detect stars down to the seventeenth magnitude, which are quite invisible to the naked eye. Without a telescope, it is possible to detect stars of the ninth magnitude with a selenium cell, and only the sixth magnitude with the unaided eye. It will thus be seen that the selenium cell has proved to be a valuable adjunct to astronomical observation.

The appended bibliography will serve to indicate the scope of the more mundane applications of such devices.

From the time of the discovery of the light-sensitive property of selenium in 1872 numerous investigators have attempted to formulate a satisfactory theory. Up to the present, however, there is no single theory which adequately accounts for all the various phenomena associated with the photo-conductive effect.

One of the first attempts to formulate a theory was made by W. G. Adams,* who held the view that conduction in selenium was due to electrolytic causes. It was soon pointed out that selenium is not an electrolyte, but an element, so that the hypothesis seems untenable. Considerable discussion of the possibility of photo-conductivity being due to the formation of selenides is due to S. Bidwell*. There is considerable experimental evidence for this proposal, but no complete theory has been evolved from it.

Following these developments it was suggested by Himstedt* that the increase of conductivity with illumination might be indirectly due to the action of the light itself. The suggestion has been followed up by Davis,* Chabot† and Merritt,‡, but in this case also no definite theory has resulted.

At about the same time the electron theory of photo-conductivity was being developed by numerous investigators, including Berthier,* Pfund,† Vonwiller,‡, Richardson,§ Nicholson,** Spaeth,†† and many others. This must be regarded as one of the most important theories, and is probably more nearly true than any of the previous ones. According to the electron theory the incidence of light upon selenium liberates free electrons, which can be accelerated by the application of a potential difference and are thus made manifest in the form of a current stronger than that which would flow with the same difference of potential if no light acted on the selenium.

An ingenious theory was developed in 1918 by D. Reichinstein,* who suggested that owing to polarisation effects consequent upon the application of an e.m.f. to selenium, the apparent resistance is much larger than the true resistance, and varies in proportion to the applied voltage. While there is experimental

* Journ. Soc. Telegraph Eng., 2, 1873, p. 31; Nature, Feb. 20, 1873.
† A full discussion of the various types of selenium cell is contained in Ch. II of Barnard's book, "The Selenium Cell," which also gives an extensive bibliography.
* Illum. Eng., 10, 1917, p. 115.
†. Proc. R. S., 23, 1875, p. 535; Phil. Mag., 1, 1876, p. 155; Phil. Trans. R. S., 167, 1877, p. 313.
‡ Proc. Phys. Soc., 7, 1885, p. 129; Phil. Mag. 40, 1895, p. 233.
§ Ann. der Phys., 4, 1901, p. 531.
** Nature, 70, 1904, p. 506.
†† Phys. Zeits., 5, 1904, pp. 103, 168, 517, 584; *ibid.*, 6, 1905, pp. 37, 619, 620.
‡‡ Phys. Rev., 25, 1907, p. 502; Electrician, 60, 1908, p. 715.
* C'Ecl. El., 38, 1904, 441.
† Phys. Rev., 28, 1909, 324; Phys. Zeits., 10, 1909, 340.
‡ Proc. R. S. (N.S.W.), 43, 1910, p. 361.
§ Phil. Mag., 23, 1912, p. 277.
** Phys. Rev., 2nd ser., 3, 1914, p. 1.
†† Zeits. für Phys. 8, 1922, p. 165.
‡‡ Zeits. wissen. Phot., 17, 1918, p. 16.
** Verh. d. deutsch. Phys. Gesell., 9, 1907, p. 165.

evidence of a back-e.m.f. due to polarisation, the theory requires that the photo-sensitivity should decrease with a reduction of applied voltage, and since Greinacher* has shown this to be contrary to experimental evidence, the theory cannot be regarded as satisfactory.

A theory which has found growing acceptance was published in 1913 by d'Albe. This theory is based on the corpuscular theory of light, which assumes that a beam of light consists of minute corpuscles, called photons, and may thus be regarded as having a discontinuous structure. When a beam of light falls upon selenium there is assumed to be an interaction between the incident photons and the selenium atoms which results in the liberation of electrons from these atoms. The subsequent behaviour of the electrons ejected in this manner will depend upon the electrical potential acting upon them, and will thus be determined by the applied potential difference. The increase of the number of free electrons in this manner will be manifest as an increase of conductivity. The ejection of electrons from their atoms will produce positively charged ions (*i.e.*, atoms with one or more electrons missing) which will represent a natural attraction for any free electrons, whose success in finding an ion will obviously depend upon the number of ions present.

Since the liberation of an electron by the incident light must also result in the production of an ion, it is evident that the rate of recombination of the electrons and ions will always be proportional to the square of the number of ions, so that if C is the incident light energy, and N the number of ions which it produces, the rate of change of conductivity, i.e., the rate of increase in the number of ions can be expressed by

$$dN/dt = C - kN^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where k is a constant. Integrating this expression to find the number of ions produced (*i.e.*, the total change of conductivity) after time t, we have

$$N = \sqrt{C/k} \tanh (t\sqrt{C}) \quad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

It will be noted that this expression is of the general form $N = KC^x$, for a given value of incident light energy, and since N represents the change of conductivity $G_1 - G_0$ between the illuminated and dark conditions respectively, we may write for the total change of conductivity,

$$G = G_1 - G_0 = KC^x \quad \ldots\ldots\ldots\ldots\ldots \quad (3)$$

in which K and x are constants of the material. A curve connecting G with log C will thus represent the general characteristic of a selenium detector.

After the lapse of sufficient time under illumination there will be a condition of stability, in which the rate of recombination of the ions is equal to the rate of their production. Under these conditions the differential in equation (1) is zero, and therefore $C = kN^2$, so that

$$N = \sqrt{C/k}, \text{ or}$$
$$N = k\sqrt{C} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

The foregoing considerations apply also to the condition of reduced or discontinued illumination. Since the rate of recombination of ions is proportional to the square of the number present, it follows that the process commences rapidly as soon as the light is removed, proceeding at a rapidly decreasing rate until all the disturbed electrons have returned to the ions, thus neutralising them, and restoring the conditions of dark-conductivity, corresponding to the normal number of free electrons.

(The section dealing with photo-electricity will be published next month.)

"Pye Teleceivers"

(Continued from page 216)

amplifier and output stage. The high tension and filament voltages for the 7-m. sound channel and broadcast receiver are obtained from a separate mains transformer and full-wave rectifier mounted on the 7-m. sound channel chassis.

The I.F. band width of 150 kc. prevents any loss of the sound transmission due to frequency drift of the oscillator, etc.

The operation of the "Teleceiver" is very simple. In the case of Model 4042, the wave-range switch on the right-hand side of the control panel is set at "T," whilst in Model 4043 the wave-range switch on the front is set at "Gram," and the master switch on the top panel is set at "Television," each receiver is now ready for the reception of the television programmes.

In both models the television picture controls are on the left-hand side, and are four in number. They control the line frequency, frame frequency, contrast (depth of picture), and brightness.

No tuning whatsoever is carried out by the operator of the "Teleceiver" on either vision or sound, all circuits are pre-set at the factory. The large bandwidths of the bandpass I.F. amplifiers of both vision and sound channels ensure that the receiver is always in tune. Only the volume and tone controls need be adjusted for the television "sound."

Subsidiary controls to the double time base and Synch. separate unit can be operated from the back of the receiver, but are pre-set.

The aerial equipment supplied with the "Teleceiver" consists of a quarter-wave rod fed to the receiver by a weather-proofed low-loss concentric feeder.

A Chance for Inventors

A correspondent is desirous of taking up the manufacture and sale of a multi-change multi-wave switch particularly for short-wave work. We shall be pleased to put any reader who has a design for a switch of this type which is not already on the market in touch with our correspondent with a view to negotiation.

American S.W. Publications

MOST useful American radio publications are obtainable through F. L. Postlethwaite, G5KA, 41 Kinfauns Road, Goodmayes, Ilford, Essex.

The Rand, McNally's radio map of the world, is now available. This map, measuring 30 ins. by 40 ins., is printed in six colours, showing 230 countries and 180 prefixes. Time in all parts of the world is shown, while great circle measurements in miles or kilometres can be accurately measured by better than 2 per cent. This map, costing 5s., is invaluable to all receiving and transmitting amateurs.

It is said that the most important part of a station is the aerial, and nowhere more than in America, is this point more fully appreciated. The "Radio" Antenna Handbook is the last word in up-to-date information on all types of aerials, and at 2s. 6d. is good value for money.

Hints and tips which are often of great assistance to constructing amateurs, are difficult to remember. The A.R.R.L., however, have gathered together several hundreds of little time-savers, and included them in a book entitled "Hints and Kinks." This is also available through 5KA for 2s. 6d.

RECENT TELEVISION DEVELOPMENTS

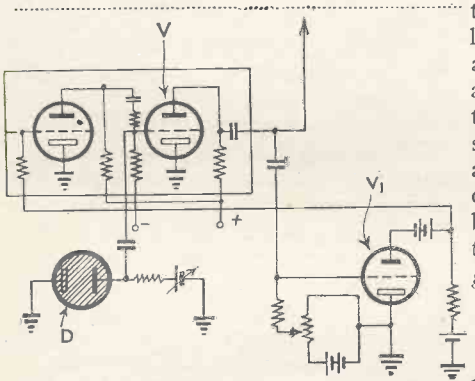
A RECORD OF PATENTS AND PROGRESS
Specially Compiled for this Journal

Patentees:—Radio Akt. D. S. Loewe :: Marconi's Wireless Telegraph Co. Ltd. and G. B. Banks :: Scophony Ltd., J. D. Baynes and G. Wikkenhauser :: J. E. Keystone, F. N. Nicoll and O. Klemperes :: Marconi's Wireless Telegraph Co. Ltd. :: Baird Television Ltd. :: T. M. C. Lance and E. H. F. Pattinson

Synchronising Systems

(Patent No. 457,879.)

The picture signals and the synchronising-signals are usually separately amplified, before being mixed and fed to the transmitting aerial. Since some of the picture signals will naturally be of the same "polarity" as the synchronising impulses, it becomes necessary to ensure that they



Method of preventing picture signals affecting synchronisation. Patent No. 457,879

do not also reach the same amplitude, as otherwise they would tend to produce "false" synchronisation at the receiver.

Accordingly steps are taken to prevent any picture from reaching a voltage in excess of a certain value. As shown in the figure, this is ensured by shunting the grid of the last amplifier V with a gas-filled diode D, which acts as a limiter directly the picture signals approach the level of the synchronising-impulses. The output from the valve V is rectified at V1, and the derived voltage is used to regulate the amplification of preceding valves. This automatically adjusts the amplification to compensate for the difference between a "light" and "dark" background. —*Radio Akt. D. S. Loewe.*

Magnetic Scanning

(Patent No. 457,929.)

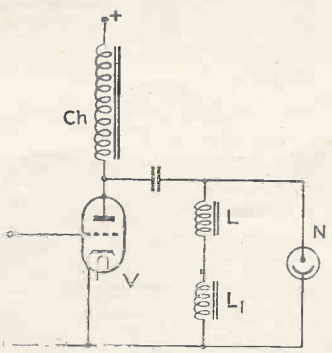
When magnetic deflecting-coils are used to control the scanning in a cathode-ray tube, the effect of their high inductance makes it difficult to preserve the saw-toothed oscillations in proper form. More particularly, the inductance tends to lengthen the "fly-back" period.

According to the invention the difficulty is overcome by automatically short-circuiting the coils during the "idle" stroke of the control. The figure shows the two magnetic coils L, L1 which serve to deflect the electron stream inside the cathode-ray tube (not shown). Saw-toothed oscillations from the time-base circuit are applied to the grid of the valve V, and are diverted by the choke Ch into the coils L, L1. The latter are shunted by a neon tube N, which is automatically discharged by the inductive voltage during the "fly-back" stroke, so as to short-circuit the coils.—*Marconi's Wireless Telegraph Co., Ltd.*, and *G. B. Banks.*

Preventing "Afterglow"

(Patent No. 458,382.)

When rapid changes occur in the light-intensity of the background, or a part of the background, of a scene or picture being televised, as for instance when an outdoor scene in bright sunlight is quickly followed by



Preserving correct form of saw-tooth waveform in magnetic scanning. Patent No. 457,929

a studio scene in more subdued light, there is a tendency at the receiving end for the "high" light to persist on the fluorescent screen, due to "afterglow." This, in turn, tends to spoil the effect of the suceeding scene.

Accordingly, means are provided at the transmitter for artificially reducing the intensity of the "high light" scene just before the change-over. Where, for instance, transmission is from a cinema film, a certain number of the "frames," just before the change of scene, are deliberately treated to increase their opacity. Or, when outdoor scenes are being televised, a shutter or filter is interposed so as to intercept some of the light falling on the photo-electric cell.—*Scophony, Ltd., J. D. Baynes* and *G. Wikkenhauser.*

Focusing in Cathode-ray Tubes

(Patent No. 458,746.)

In the ordinary way, the electron beam of a cathode-ray tube is brought to a focus at a certain point, and it can only retain that sharp focus so long as it is moved over a truly spherical surface. But, in the case of a television receiver, the fluorescent screen is nearly a plane and not a spherical surface, so that parts of the picture must appear slightly out of focus.

Again, in a cathode-ray transmitter of the kind using a "mosaic" electrode of photo-sensitive cells, the latter are set in a plane surface arranged at an angle to the path of the stream, so that here again a certain amount of distortion must result, due to de-focusing.

According to the inventor these difficulties are removed by a suitable disposition of the focusing electrodes inside the tube. At the same time, special compensating voltages are applied to the two pairs of deflecting plates, so as to maintain the beam accurately in focus on all parts of a non-spherical fluorescent screen.—*J. E. Keyston, F. N. Nicoll* and *O. Klemperer.*

Television "Cameras"

(Patent No. 458,750.)

A certain part of a picture that is being televised by a camera of the Iconoscope type, is selected and shown in enlarged form at the receiver. The effect is similar to that known as a "close-up" on the cinema screen.

The result is secured by regulating

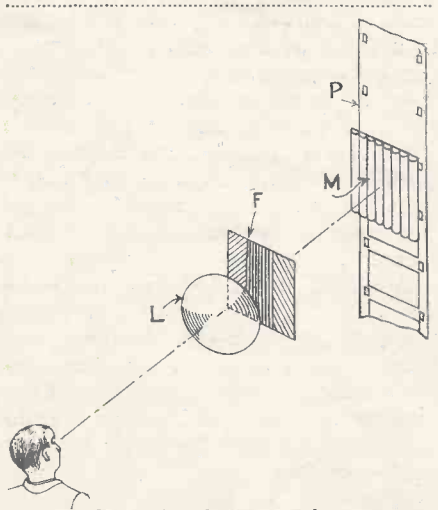
the amplitude of the deflecting voltages so that the scanning beam, instead of covering the whole picture, is restricted to a selected area. At the same time, the voltages on the auxiliary anodes are adjusted so as to " sharpen " the focus of the beam to the smaller area. The intensity-control voltage on the Wehnelt cylinder is correspondingly varied.

The selected area covers the entire screen at the receiver, giving the effect of a " close-up." The particular area to be shown enlarged is selected by regulating the current passing through a pair of auxiliary deflecting-coils.—*Marconi's Wireless Telegraph Co., Ltd.* (Assignees of *H. Iams*).

Television in Colour

(Patent No. 458,791).

Light from the object to be televised is projected through a lens L, and through a light-filter F built up of the three primary colours, red, blue and green, on to a photographic film P. Immediately in front of the film is placed a lenticular grating M, which consists of a row of cylindrical lenses placed side by side.



System for television in colours. Patent No. 458,791

The grating projects on to the film a striated image of the filter F, the image containing one, two, or three portions of light, according to the colour of the part of the object from which the light is reaching the grating.

The film is next developed and fixed, the picture then appearing as a striated monochrome. It is next scanned crosswise, and the resulting signals are transmitted to the receiving station, where they are again recorded as a film. This is finally projected in colours on to a viewing-screen, through an optical arrangement which is the reverse of that shown in the drawing.

A stereoscopic effect can also be secured by using a double lens in front of the colour filter, so that alternate strips on the grating M project left and right eye images respectively. —*Baird Television, Ltd., T. M. C. Lance,* and *E. H. F. Pattinson.*

[Summary of other Television Patents

(Patent No. 456,450.)

Valve amplifier adapted to transmit a wide band of television signals, including " zero " frequency, with uniform attenuation.—*E. L. C. White.*

(Patent No. 456,564.)

Improvements in the wave-form of the synchronising-impulses used in an interlaced scanning system for television.—*Marconi's Wireless Telegraph Co., Ltd.*

(Patent No. 456,582.)

Means for changing-over from one studio to another when transmitting a television programme.—*C. F. Chapter* and *Baird Television, Ltd.*

(Patent No. 456,650.)

Method of radiating synchronising impulses between repeater trains of picture signals in television.—*E. L. C. White.*

(Patent No. 456,651.)

Synchronising means for an interlaced system of scanning in television.—*M. Bowman-Manifold.*

(Patent No. 456,666.)

Saw-toothed oscillation-generator for the time-base circuit of a television receiver.—*G. R. Tingley, D. W. Pugh,* and *Baird Television, Ltd.*

(Patent No. 457,129.)

Means for separating out the various synchronising impulses in a television receiver.—*G. R. Tingley* and *Baird Television, Ltd.*

(Patent No. 457,135.)

Time-base circuit particularly designed to prevent line " overlap " in interlaced scanning systems.—*Marconi's Wireless Telegraph Co., Ltd.*

(Patent No. 457,531.)

Providing a border of conducting material around the mosaic-cell electrode of a cathode-ray television transmitter of the Iconoscope type. —*J. D. McGee, S. P. Freeman,* and *W. S. Brown.*

(Patent No. 457,532.)

Separating or sorting-out signals of different amplitudes used for synchronising.—*Murphy Radio, Ltd., K. S. Davies,* and *H. F. W. J. Freundlich.*

(Patent No. 757,757.)

Using electrostatic focusing, and electromagnetic deflection, in a cathode-ray tube, without mutual interaction and interference.—*Radio-Akt. D. S. Loewe.*

(Patent No. 454,319.)

Superhet receiver for television utilising an intermediate frequency approximately four times the maximum modulation frequency.—*Radio-Akt D. S. Loewe.*

(Patent No. 457,773.)

Transformer coupling for a television amplifier handling a wide range of signal frequencies.—*Radio Akt. D. S. Loewe,*

(Patent No. 457,879.)

Limiting device for combining picture signals and synchronising impulses.—*Radio Akt. D. S. Loewe.*

(Patent No. 458,032.)

Photo-electric amplifier using two cells arranged so that each corrects the " fatigue " of the other.—*S. Vasilach.*.

(Patent No. 458,135.)

Mains unit for supplying a cathode-ray tube receiver, and its time-base circuit, with operating voltages.—*E. Reader and L. Glass.*

(Patent No. 458,586.)

Preparing a photo-sensitive electrode, consisting of a mosaic of silver-caesium cells, for use in a cathode-ray transmitter.—*L. Klatzow.*

(Patent No. 458,618.)

Rigid anchoring of the optical elements in a scanning drum of the mirror type.—*Ferranti, Ltd.,* and *M. K. Taylor.*

(Patent No. 458,635.)

Improvements in the preparation and composition of fluorescent screens.—*N. V. Philips Gloeilampen-Fabrieken.*

(Patent No. 458,798.)

" Noise suppressor " circuit for a combined sound and television receiver.—*Marconi's Wireless Telegraph Co., Ltd.*

(Patent No. 458,878.)

Method of centring the picture, relative to the undeflected position of the electron stream, in a cathode-ray receiver.—*General Electric Co., Ltd., R. J. Dippy,* and *D. C. Espley.*

(Patent No. 458,883.)

Method of generating synchronising impulses from a rotating-disc scanner.—*General Electric Co., Ltd.,* and *D. C. Espley.*

(Patent No. 458,923.)

Mounting the mirrors on a scanning drum so as to facilitate adjustment in two directions.—*J. Bell* and *W. S. Worthington.*

STUDIO & SCREEN

A MONTHLY CAUSERIE on Television Personalities and Topics

by K. P. HUNT
Editor of "Radio Pictorial"

THE decision reported last month, that in future only one transmission system would be used by the B.B.C., already has simplified and eased the working at Alexandra Palace to a gratifying extent. Nothing like the full benefits ultimately to be derived have yet been secured, however, because there is a considerable amount of Baird apparatus yet to be removed from the Palace. At the time of writing these notes, several Baird engineers are still on the premises, and appear to be holding a sort of watching brief.

* * *

From the national point of view, keen interest continues to be shown in the possibilities of televising the forthcoming Coronation. Contradictory reports have appeared in the lay Press, but I hear it has now definitely been decided to televise the procession.

Any possibility of televising other parts of the Coronation ceremony—which, of course, hold greatest interest for the general public—has now been completely abandoned. So far as I have been able to learn, television cameras will merely be stationed at a point or points along the route, and shots will be shown of the most interesting parts of the procession as it passes by.

A few days ago I was told by a prominent television official that the B.B.C. has been fortunate in securing what might be called an absolutely ideal site along the route, but it is not proposed to tell anyone of its precise location until after the Coronation. When I asked the reason for this meticulous secrecy (now, alas, rather usual in all television matters), it was explained to me that if the site of the television cameras were known to the public, it is almost certain that huge crowds would congregate there, and in all probability something would happen to upset the arrangements.

In view of the great interest evinced by the newspapers ever since the question of televising the Coronation was first mooted, it seems rather strange that official permission to televise the most important parts of the ceremonies has been refused. The real reasons for this are known only to the Government, but after making many inquiries, it has seemed to me that a feeling is in the air, at least at the Alexandra Palace, that television might reveal too much. A television camera, as we know, can tell the brutal truth so well that perhaps in official, and particularly national matters, this virtue conceivably might become rather a disadvantage. During ordinary sound broadcast commentaries, if an important personage makes a slip, the matter can easily be slurred over and usually is, and in most cases is not even mentioned by the commentator. But this all-seeing television camera is an entirely different proposition, and it may well be that the Powers-That-Be decided that in this case its use might be attended with certain inconveniences which outweigh the advantages.

A brilliant television future is forecast for Irene Prador who is in the programme on April 6th.

The Coronation programme is expected to occupy fifteen minutes, and, of course, will show the Royal coach. It is unlikely, I am told, that the programme will be continuous, but that it probably will be punctuated with some sort of interludes.

* * *

In passing, I should point out that here is an instance of a programme in which the Baird intermediate film system, now abandoned, would have been distinctly useful. The 40 seconds of lag which takes place in this system between the event and its actual appearance on the television screen would have been extremely useful in the event of a contretemps, and it seems likely that if this system had been available all possible official objections to the televising of the Coronation ceremony itself might have been surmounted.

The camera for televising the procession will, of course, be fitted with a telephoto lens, in order to give televiewers really close-up images of Their Majesties.

Use of telephoto lenses in television is now being extended considerably, and numerous experiments in their applications have been made in the programmes. One example was in the recent boxing match. Two cameras were then used, one with the usual F/3 lens of 6½-in. focus, and the other with a telephoto lens. The first was so placed that it embraced in its field of view the entire ring, while the other was used for showing close-ups of the boxers themselves.

Telephoto lenses have also been employed for O.B.'s in the park, but their more extended use at present seems to involve certain technical problems which have not yet been fully solved. For instance, in ordinary photography one of the chief advantages of a long focus lens used at a distance from the object is that a much better perspective is obtained, while better modelling of the subject is also evident, and it is well-known that a short focus lens used at close range frequently results in distressing distortion.

The result of using telephoto lenses in television, however, does

A FORECAST OF TRANSMISSION IMPROVEMENTS

not appear to be precisely the same, for although naturally the image is rendered on the screen on a relatively larger scale, the telephoto lens in television does not seem to improve the perspective at all, but rather tends to distort it. To mention but one example, a cricket pitch seen on the television screen in this way appears to be disproportionately short, and certainly not in true perspective.

Again, in the important matter of modelling, the advantages usually associated with the telephoto lens in ordinary photography cannot be said to be fully achieved in television, because the images obtained in this way are often notably flat, instead of being improved in depth and plasticity.

In fact, it is generally realised, I think, that the whole question of television cameras is still very much in the melting pot, and it was plainly hinted to me only a few days ago that some big changes are imminent. To be more specific, I was told that the Marconi-E.M.I. people are about to introduce a new camera which will effectively remedy some of the many defects associated with the present Emitron camera.

The most notable improvement, I understand, will be in the colour response curve of the new camera. The present Emitron, as is well known, is most responsive to green and blue, resulting in a tendency for these colours to be rendered whitish. On the other hand, red makes less impression on the instrument and consequently comes out on the screen considerably darker.

In this respect the present Emitron has properties similar to the orthochromatic film used in ordinary photography, and I am told that the new camera will aim at a colour response curve which is much straighter and which will correspond roughly to the usual panchromatic film employed in ordinary photography.

If the colour response curve can be improved in this way, and a panchromatic rendering achieved, there can be no doubt that it will represent a tremendous step forward, because at the present time the tone values of pictures on the television screen are not correct, and anything which will do away with the " soot and whitewash " effect now so evident will be welcomed.

* * *

It was hinted to me that another advantage of the new camera destined to replace the present Emitron is that it will work effectively with considerably less light. Here again, it is not merely a matter of lens aperture, as in ordinary photography, because television has already been accomplished in mist and exceedingly poor light which even experts prophesied would be a complete failure, yet to everyone's astonishment good images were secured. Televiewers will remember, for instance, the sheep dog trials which were televised successfully in mist, the received images being entirely satisfactory. People on the spot who were outside in the open-air when this was done said the result could not possibly be any good, and as a matter of fact the programme was closed prematurely for this reason. Yet at the receiving end good pictures were secured.

Experiments with various types of colour filter in front of the lens are also being made continuously with a view to improving the tonal values. Another scheme that has been successfully adopted for improving the lighting of outdoor subjects is the use of spotlights. It is an unusual practice to have spotlights in daylight scenes, but it has already proved successful, a fine example of which was in the car parades recently televised.

* * *

The exact nature of this new Marconi-E.M.I. camera and its capabilities are, as usual, being kept a close secret, but as much as is publicly known gives grounds for the conjecture that we shall soon have equipment capable of televising events in almost any light, and that direct television for instance of theatrical productions is now appreciably nearer. Some support for this prophecy is given by the B.B.C.'s considerable activity in laying television cables in and around London. Last week I saw one of the cables being laid in Lower Regent Street. But here once more, as an example of the annoying mystery mongering which is going on, no information is available as to which points are being linked up in this way. It is fairly evident, however, that the B.B.C. is taking urgent steps to fling a belt of television cables all around London's theatreland, and that, in due course, there will be a network almost as extensive as the B.B.C.'s ordinary O.B. links.

* * *

New faces are constantly being added to the Alexandra Palace staff, which is growing almost from week to week. Messrs. Crier, Smith and Bate are three new stage managers who have recently been appointed at the Palace. This now makes five stage managers in all.

Two other newcomers are Eric Crozier and G. Morley—two young men destined to become future producers. Both are about twenty years old, and have come straight from the B.B.C.'s famous Staff College. I understand that in future Mr. Morley is going to produce " Picture Page."

* * *

Mary Allan, the popular make-up expert and wardrobe mistress at the Palace, broke all records when Jack Payne and his celebrated band were televised recently. She made up 30 faces in 30 minutes! Some going.

Testing " His Master's Voice " television receivers at the H.M.V. factories, Hayes, Middlesex. H.M.V. are now producing television receivers by large production methods.

NEWS FROM THE STUDIO

Jack Payne's show, by the way, was extremely successful, and quickly resulted in numerous congratulatory telephone calls and letters. It was, I think, one of the fastest moving shows yet produced, and the boys themselves got a great kick out of it. This television broadcast must have given Jack himself a little cause for reflection, because it was he who, way back in October, 1931, gave the very first 30-line transmission under the ægis of the B.B.C. The band appeared in its usual stage act, and the performance was notably slick and peppy. It ran for half-an-hour with no intervals, and introduced the band's celebrated Russian turn, complete, of course, with Russian hats.

* * *

Talking about bands reminds me of Henry Hall's anniversary television show. This was a great effort, and the idea of the big birthday cake was a particularly happy one.

Mary Allan, by the way, now has an assistant, Pamela Hyde. I asked Pamela what made her go into television, and learned that hers was one of those delightful little romances of getting a job which do sometimes happen. She was so interested in television that she just sent in an application mentioning her qualifications and hoping that they would find her a job. That, of course, was some months ago, but there was no opening at the time and her application was put on one side. Pamela herself almost forgot all about it. Then, during the Christmas rush, an assistant was wanted at the Palace and her letter was hurriedly found. Within a few hours she was up from the South Coast where she lives and landed the job!

* * *

A big part of Mary Allan's work is now connected with the wardrobe at the Palace, and the B.B.C. already has in stock dozens of dresses for day and evening wear. All the television dresses are tested out on that most conscientious of artists—Television Tilly—who can withstand the glare of the fiercest lights without wilting and never gets tired. I should explain that Television Tilly is a dressmaker's model on which the dresses are put while they are viewed on the screen.

Tilly, by the way, does not mind being bitten by a parrot—as Elizabeth Cowell, the charming television hostess-announcer—does! I must not forget to tell you this story about Elizabeth Cowell and the parrot.

Elizabeth hates parrots because parrots, apparently, hate her. David Seth-Smith, the famous Zoo-man, brought "George" to the studio, and he (the parrot, of course), chased Elizabeth into the corner of the studio and bit her twice on the ankle. After doing the naughty deed, "George" then exclaimed in a loud voice: "I wanna get outa here." Fortunately, the bird did not draw blood, although Elizabeth seemed pretty scared and now, I hear, stands clear of all livestock in the studio.

That isn't the first time it has happened. The Rev. F. W. Turner brought the famous parrot "Cocky" to the television studio and he told all the staff that the bird would not hurt anyone, yet as soon as Elizabeth appeared he struck a threatening attitude which boded no good for her.

* * *

D. H. Munro has done quite a lot of production work during the month, one of his notable successes being that of Mr. Cochran's "Young Ladies" early in March. Cecil Madden is now programme organiser and responsible for balance, light and shade.

But from the production point of view, the man in the limelight last month was Stephen Thomas, whose new experiments in studio technique attracted considerable attention among televiewers and aroused tremendous interest at A.P. The notion of showing on the screen several different aspects of a subject at once was entirely his own idea and in the first place was, I hear, received at Alexandra Palace with a certain amount of diffidence. However, the scheme was tried out on March 2 in his programme "After Supper," in which several first-class artists were seen.

The experiment consisted in the simultaneous use of different cameras placed in such a manner that they covered different sections of the screen. A four-part fugue by Bach was utilised and the idea was first to show the figure of Maude Lloyd dancing solo. A second view of the same clever dancer then appeared by the side of the original figure, which later was triplicated, and finally four views were shown simultaneously. After this was fully demonstrated, the figures began to disappear in a similar way to which they appeared, finally leaving the single figure once more on the screen. The intermingling of these effects was attractively novel and had a kind of mystic appearance which was fascinating and admirably suited to the music. I should mention in passing that the music in this instance was specially orchestrated for the Television Orchestra by Cyril Clarke, who plays 2nd clarinet in the Television Orchestra, while Miss Lloyd deserves a special word of commendation for her excellent interpretation.

All this was extremely clever and gave us a foretaste of the wonderful effects which can be produced on the television screen by trick photography. It was generally supposed that this was the first time that trick photography had been used in this way, which is true so far as the present transmissions are concerned. In the old 30-line days, however, quite a number of similar things were done. I remember the extraordinary conjuring effects which I believe were done by Sutherland Felce, and so on. Even at Alexandra Palace, the staff have seen Leslie Mitchell on the screen shaking hands with himself. But this was on closed circuit and not broadcast. It makes you begin to wonder whether we shall not soon have a complete beauty chorus on the television screen consisting only of one girl. And they would all be perfectly in step!

* * *

Stephen Thomas has been devoting a lot of attention to ballet and mask dances during the month.

Dallas Bower has distinguished himself by writing the first original revue for television, called "Pasquinade," which was successfully produced a week ago. Peter Bax nowadays is concentrating mainly on scenery. The stage management work now is not so rushed as it was, owing to the appointment of the three new members of the staff.

* * *

Irene Prador, who is in the April 6 programme, undoubtedly has a brilliant television future before her, and is regarded at A.P. as the first real television star. She is an extremely versatile artist, sings in German, French and English, and, as televiewers already know, is particularly easy to look at.

Our Readers' Views

Correspondence is invited. The Editor does not necessarily agree with views expressed by readers which are published on this page.

Distant Television Reception

SIR,

I was interested in the letter from your correspondent J. Taylor, on the reception of the television transmissions in the Isle of Wight.

In it he mentions that the signals are stronger at night than during the day. I thought it might be of interest to report that this has also been observed by amateur stations in this neighbourhood working on the 56 mc. band.

During a series of tests carried out by the members of the local Radio Society here, a very definite increase in the strength of signals occurred just about twilight, i.e., from 16.30-17.00 G.M.T.

Until Mr. Taylor's letter I had not seen this effect mentioned in print. It would be interesting to hear the views of others working on the five-metre band on this point.

A. C. GEE (G2UK)
(Southend-on-Sea).

Pirates

SIR,

One of the most general topics amongst transmitting amateurs to-day seems to be the question of "Call sign pirating," a thing which would appear to be increasing rapidly, as in this district alone nearly all call signs have been pirated during the last few months.

On the face of it there would seem very little that can be done as if a station comes on giving what appears to be a genuine call and the transmission is within the band there is nothing to indicate that he is a pirate. I would make this suggestion to transmitting amateurs which I think will help. This is that when calling or signing they give the town or district in which they are located and also the power used—this will give listening stations a good guide as to the strength such a transmission should be received, taking general conditions into consideration. Where they suspected that it was not a genuine transmission by the station to whom the call was allocated a report would establish whether this was the case or not.

This would enable the call sign owner to report to the authorities that his sign was being pirated, and to give them an idea of the location of the pirate station.

N. J. FITZGERALD (Wanstead).

5-metre Activity

SIR,

I was amazed to read G2KT's letter on 5-metre activity in the current issue, and it is most obvious that it is his knowledge of current methods and practice that is obsolete.

The serious experimenter is well ahead of any of his suggestions, and would not dream of fitting the suggested aerial array, which is difficult and expensive to build.

There has been little reduction in activity for the past 12-18 months, and long-distance reception is an accomplished fact, be it freak or otherwise. Superhets are as common as super-regens and straights, and there are very few transmitters to-day without some form of frequency control.

Further, I would point out that no brand of frequency control will give greater range of reception, that mathematically correct systems are not always perfect and that the frequency stability of the average amateur's transmissions are as good as found on the low-frequency bands.

In conclusion, I hope G2KT is not going to suggest that because some broadcast listeners have interference from the Alexandra Palace transmissions that the B.B.C. have omitted some method of frequency control.

T. VICKERY (G5VY) (London, N.).

Contact Wanted

SIR,

I have been endeavouring to contact some British amateur who is also a constructor of limited means like myself. I build receivers of from 1 to 4 valves, and I wish to correspond and exchange items of interest regarding short-wave receivers, reception and general topics of interest.

LE ROY BLINN
(R.R. 4 London, Ontario, Canada).

On a One-valve Set

SIR,

I built the one-valve U.S.W. set designed by G2HK and described in the March issue of TELEVISION AND SHORT-WAVE WORLD. I used a 7-plate condenser instead of a 2, 5-turn coils ¾ in. diam., and a pentode instead of a triode. I connected it to an aerial of 16 gauge single bell wire in the roof.

At 8.20 p.m. I heard an amateur say, "I will call you later on." At 8.40 I picked up W9BHB talking about his diamond aerial and the effect of placing the aerial resistor in different places.

Next I got American police cars and heard a call to all cars re a coast fire, and later a short tuning note and a call to car 6X31 Park Avenue. I then took the set downstairs and, using the curtain rod for aerial, received Alexandra Palace until 10 o'clock. I found that the sound transmission could be got without an aerial.

I listened onwards till 10.30 and received many Americans, among them being W3FKK, W6IOS, W2AOE, and W2 or WT, 5BF.

The H.T. was 180 volts, no S.M. dial was used, and the whole receiver was mounted on a wooden base.

What I would like to know is what does the writer mean when he describes his set as a "local distance" set?

H.J.P. (Kingsbury).

Television at 60 miles

SIR,

We have installed at one of the highest points in Brighton, at a distance of about 60 miles from the Alexandra Palace, a standard G.E.C. television receiver, Model No. BT3701. The aerial used is a half-wave dipole with a reflector, which is on the top of a 60-ft. mast. The only interference experienced is from passing cars, the installation being on a main road.

R. LEWIS (Brignton).

"The Everest Transceiver"

(*Continued from preceding page*)

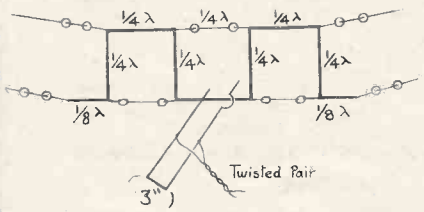
and to this most of the small components are anchored. In one position to the right the instrument operates as a complete 2-valve 5-metre receiver, and to the left as a transmitter on exactly the same frequency. The centre position cuts off all power supply.

Maximum input to this receiver is 3 watts and at 5 miles the signal strength is sufficient completely to kill the quench noise in a single valve receiver. The fact that it was used by the Everest Expedition, and very often the safety of the explorers depended on its efficiency is sufficient indication that this transceiver does all that is claimed for it. All the components and accessories are available from Messrs. Stratton & Co., Ltd., Bromsgrove Street, Birmingham.

A Bi-directional 5-metre Aerial

The information contained in this article is the result of experiments conducted by the Australian amateur, Don. B. Knock, VK2NO. This Bruce directive aerial is very popular in America.

WHATEVER the frequency used it appears that all long-distance contact makers employ some special type of directive aerial so that the radiation is localised in one particular area. Low-power stations are able by means of beam aerials to obtain results equal to those obtained by stations



This array is suitable for 72-ohm twisted pair or 600-ohm feeder.

with five and six times the power input but coupled to an omni-directional aerial.

After the exceptional results obtained last summer on the 10-metre band it was only to be expected that experimenters would turn their attention to the DX possibilities of the 5-metre band.

On this wavelength more than on any other the beam aerial is essential if signals are to be regularly transmitted over distances greater than 50 miles or so. Readers should bear in mind the results already obtained by G5BY, whose 5-metre signals have been heard in America. The aerial in this instance played a most important part and consisted of a diamond with 34-foot sides.

This aerial cannot be erected in the average garden so the more simple folded type is of greater general interest. The beam effect of this aerial is most marked, for many stations that are unworkable with a doublet or Zepp have been contacted quite easily.

The construction of this folded aerial is shown by the diagram and it will be seen that it consists of four half-waves in phase. A length of wire equal to four half-waves for a given frequency is folded in the manner suggested with quarter-wave sections, beginning and ending with a single eight-wave section.

A J system coupler is used in which a quarter-wave stub-line is closed at the bottom with one side connected to the aerial at the centre. This type of coupling is most effective when fed by a 72-ohm cable of the Belling-Lee type, but the correct tapping point for this feeder is where the stub is connected to the aerial.

If 600-ohm cable is used the tap point is more towards the closed end, the correct point being found by experiment.

The transmitter is loaded to the aerial with the trombone and feeder positions adjusted until a current indicating device, at the centre of one of the vertical quarter-wave section, shows maximum light or current. An absorption wavemeter with a flash-lamp bulb will do quite well to indicate maximum current or a small R.F. meter, if available, can be clipped across the section when a more accurate reading is needed.

Contrary to expectations, although this aerial is erected horizontally, it gives vertical polarisation. The space taken up is about 17 ft. by 4 ft., and the aerial should be slung between two poles.

Directivity is broadside and the angle of beam is around 10 degrees at 56 mc. For general work the quarter-wave sections should be 4 ft. and the eight-waves 2 ft., but for optimum results the sections should be cut to transmitter frequency, adding five per cent. to the calculated length owing to the fact that the sections are folded. This gives a length of about 4 ft. 3 ins. for 57 mc.

If directivity is needed only in one direction a considerable gain can be obtained by fitting a reflector behind the aerial. This reflector should take the form of a curtain and be cut to the same dimensions as the aerial, less, of course, the stub line and feeders.

Such an aerial will give the 10-watt ultra-short wave stations a good chance of long-distance transmission without building complicated apparatus.

Wireless as a Career

A SERIOUS shortage of trained wireless engineers and operators has been brought to light recently as the Services are unable to obtain anything like the correct quota of men needed. There are apparently far too few operators, both in the navy and merchant service, while the R.A.F. are now training their own radio operatives after finding it impossible to obtain properly trained radio men in civil life.

It seems that at the present time, more than at any other, radio as a profession should be seriously considered by youths who have not yet settled upon a career. As an expanding profession radio has no equal, and for that reason offers more than the usual amount of scope for advancement. Even so, the higher executive posts are only offered to those who have been properly trained and are able to undertake the responsibility.

As radio is very rarely part of the school training, very few boys are able to gain a good technical grounding unless they are prepared to undertake a course at a proper school where all branches of the industry are fully covered.

One such college is the Wireless College at Colwyn Bay, North Wales, which is situated on the sea-front and stands in its own grounds. Another is the Wireless College, Calmore, Southampton, which is of a similar type, for both are fitted with all the latest radio equipment needed for instruction in transmission, reception, servicing and television.

In both colleges there is accommodation for resident students, while if required, fees can be paid to the College after the student has qualified and obtained an appointment to a suitable position. These fees are then paid in reasonable instalments from the salary obtained.

At the Southampton College accommodation has been increased so that between 150 and 200 resident students can be taken at a time.

The training period depends mainly on the branch in which the student is to enter, but as the fundamental principles of radio remain the same for all branches, the question of specialising for any one particular section does not arise until the student has been in residence for the customary period of six months.

An indication as to the demand for wireless operators which is only a small section of the radio trade, can be gauged from the fact that Messrs. Marconi Wireless Telegraphs have immediate vacancies for 100 marine operators, and will require a further 250 during 1937.

Training for the second-class certificate, which all marine operators must have, generally takes eight months, while a first certificate needs about twelve months' training. Any student with a first-class certificate is then entitled to apply for a position as Wireless Operator-in-Charge on any British vessel.

Special training courses are now being prepared for students wishing to obtain a sound knowledge of television technique, both from the design and servicing angles. This branch of the industry offers ample scope for the well educated and trained student.

Full information on these courses can be obtained from The Principal, Wireless College, Colwyn Bay, North Wales; The Wireless College, Calmore, Southampton, or the London representative for both Colleges at 4 Winton Avenue, N.11.

Our Policy
"The Development of Television."

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