

HINTS AND TIPS FOR NEW SET OWNERS

Television

and *SHORT-WAVE WORLD*

SEPTEMBER 1939

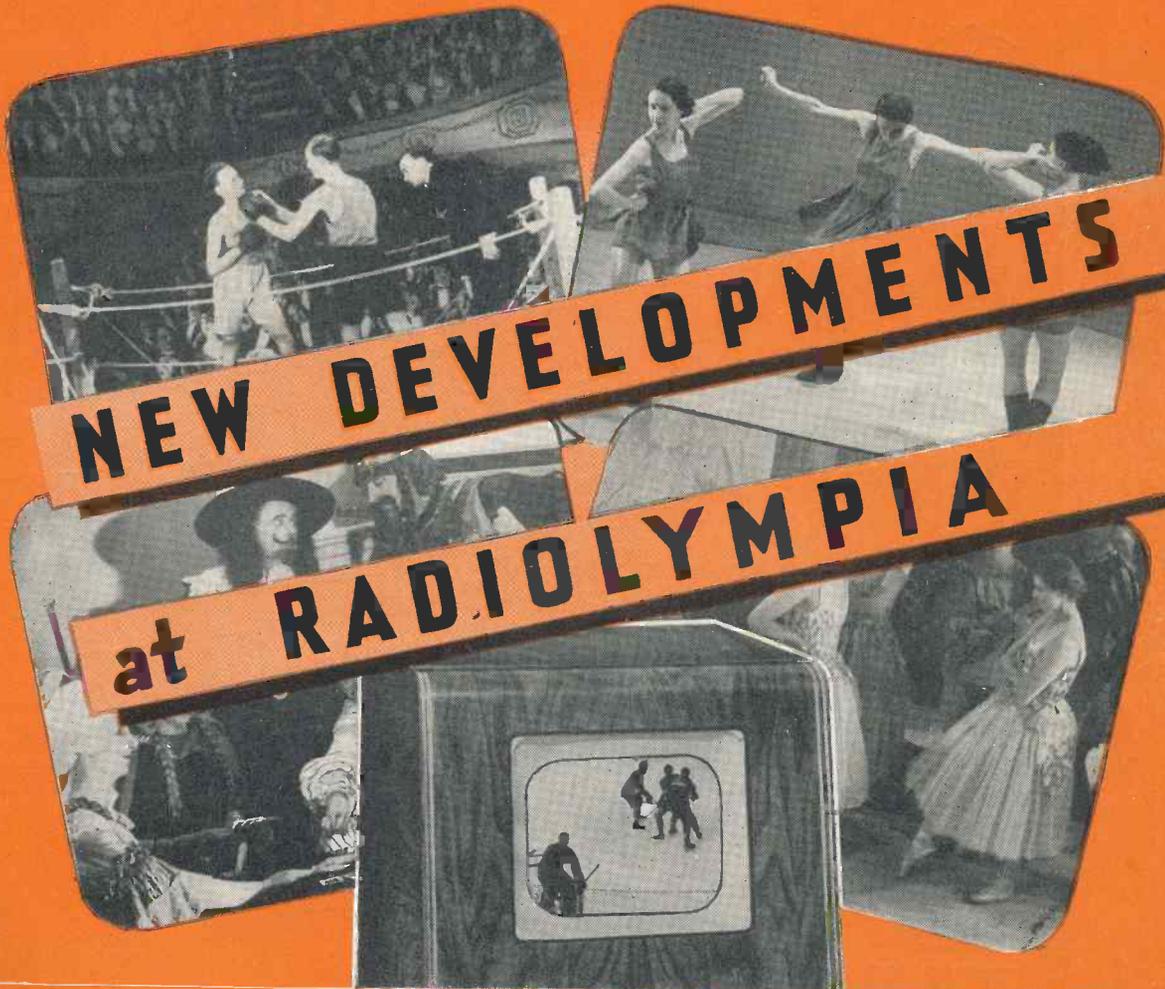
No. 139 Vol. XII.

HOW YOUR
RECEIVER
WORKS

NEW BAIRD
COLOUR
TELEVISION

SQUARE
CATHODE-
RAY TUBE

SHORT
WAVES



NEW DEVELOPMENTS

at RADIOLYMPIA

LOW-NOISE PRE-SELECTOR
AMATEUR-BAND EXCITER UNIT
GUIDE TO NEW SHORT-WAVE COMPONENTS
AND ACCESSORIES

BERNARD JONES PUBLICATIONS LTD.
CHANSITOR HOUSE, CHANCERY LANE
LONDON W.C.2.

THE FIRST TELEVISION JOURNAL IN THE WORLD

The coming season should see the introduction of television receivers into a great many homes. This is the H.M.V. console model 1802.



TELEVISION

and

SHORT-WAVE WORLD

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Comment of the Month

The New Receivers

From a cursory survey of the new receivers it might be thought that little development has taken place during the last twelve months beyond cabinet design alterations, and a tendency towards direct viewing instead of the use of the inclined mirror. Owing to the large number of receivers now available it has not been possible to do more than briefly describe them in a special survey which is published in this issue, but later we hope to deal with many new features of comparatively recent introduction that are provided in a large number of them. These include such features as noise suppression on the sound channel, no-drift tuning, phase reversal on vision, booster amplifiers for long distance reception, attenuators, simplified control, and special safety devices.

The fact that there are no radical alterations is a matter for satisfaction, and it should do much to remove from the public mind the idea that some revolutionary development is in the offing which at any time might render obsolete all existing receivers. Twelve months' experience has resulted in a certain degree of standardisation, and a cleaning-up which is very apparent in the general im-

provement of results; this is convincing proof that the public need not refrain from buying. Prices, if anything, have tended to stiffen and there seems not the slightest hope of any reduction. Receivers in the past have undoubtedly been sold at uneconomic prices so there can be little expectation of reduction even with the introduction of mass production.

The Radiolympia Conventions

If you take more than a passing interest in general technical progress, quality reproduction, short waves or television, make a point of attending one or more of the popular conventions which have been organised to take place for the first time this year. These popular conventions are in addition to the dealers' conventions and admission is open to any visitor to Radiolympia, no special tickets being required. To the dealers' convention admission is by special ticket.

The arrangements for the Popular Conventions are as follows:—
Popular Technical Convention—1.
 Monday, August 28th, 3.30 p.m.
Subject.—British technical progress and some comparisons with America.
Chairman.—Major L. H. Peter, M.C., A.F.C., A.M.I.E.E. (a Vice-Presi-

dent of the Radio Manufacturers' Association).

Speakers.—Mr. M. G. Scroggie, B.Sc., A.M.I.E.E.; Mr. T. E. Goldup, A.M.I.E.E.; Mr. G. Parr.

Popular Technical Convention—2
 Tuesday, August 29th, 3.30 p.m.

Subject.—Quality Reproduction and what it means to-day.

Chairman.—Mr. Leslie McMichael, M.I.E.E., F. Inst. R.E. (a Vice-President of the R.M.A.).

Speakers.—Mr. P. G. A. H. Voigt, B.Sc., A.M.I.E.E.; Mr. C. T. Chapman; Mr. G. A. V. Sowter, B.Sc. (Eng.) Lond., A.M.I.E.E.

Popular Technical Convention—3
 Wednesday, August 30th, 6.0 p.m.

Subject.—Short Waves.

Chairman.—Mr. E. M. Lee, B.Sc., Assoc. I.E.E. (Chairman of the R.M.A. Technical Advisory Committee.)

Speakers.—Dr. R. C. G. Williams, A.C.G.I., D.I.C., Ph.D. (Eng.); Mr. F. E. Henderson, A.M.I.E.E.

Popular Technical Convention—4
 Thursday, August 31st, 6.0 p.m.

Subject.—Television.

Chairman.—Mr. H. J. Barton-Chapple, Wh. Sch., B.Sc. (Hons. Lond.) A.C.G.I., D.I.C., A.M.I.E.E., Hon. M.I.W.T. (Chairman of the R.M.A. Television Technical Sub-Committee).

Speakers.—Mr. R. G. Clark; Mr. J. H. Owen Harries, A.M.I.R.E.; Mr. T. C. Macnamara.

All the Conventions will be held in a special room in the Empire Hall reached from the Grand Hall Gallery. This room is on the Hammersmith Road side of Olympia and is reached by a staircase just where the Grand Hall opens into the Annexe. They will last for about two hours.

TYPICAL LAYOUTS OF TELEVISION RECEIVERS

YOUR
RECEIVER
WORKS
LIKE
THIS

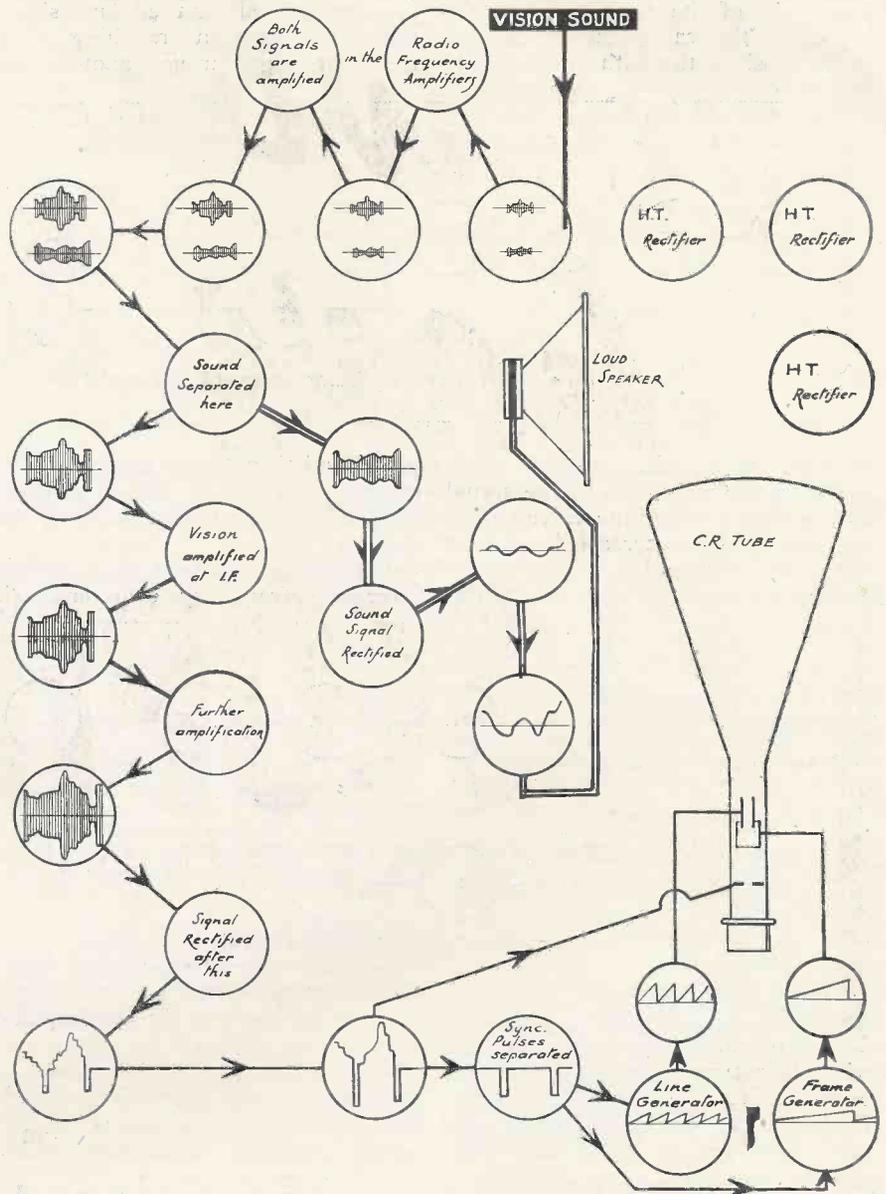
The stages which go to make up the typical television receiver shown in outline, with a brief explanation of the function of each. This information is based on designs available before the exhibition.

Although it is early to prophesy the developments which will be shown at Radiolympia, it is certain that there will be no radical departure from the lines given in this review, and visitors to the stands of the television manufacturers will find it instructive to try and pick out the various links in the chain from the aerial to the tube and identify them from these notes.

MANY readers who are introduced to television for the first time through their commercial television receiver may be puzzled by the apparent complexity of the "inside" as compared with the average radio receiver.

The reason for the complexity is mainly found in the extra circuits for the production of the line screen, and in the extra stages required for the amplification of the sound and vision signals.

It must be remembered that the amplification of very high frequencies, such as are used in the present system of transmission, presents a different problem from that of the ordinary broadcast signal, and the gain per valve stage is much lower. This necessitates the use of more stages, particularly on the vision side.



Valve line-up of G.E.C. model BT9121 receiver.

To obtain maximum gain, a superheterodyne receiver is nearly always used, although some manufacturers have a number of "straight" amplifying stages. Others precede the superheterodyne by one or two radio-frequency stages which amplify the signal as it comes from the aerial.

In nearly all cases both the sound and the vision signals are amplified by the first few valves, and the sound signal is then diverted by a separate tuned circuit and fed to the loudspeaker through its own detector and output valve.

The vision output is not only fed to the tube, but the synchronising

pulses are separated and fed to the valves of the scanning circuit.

This circuit has been simplified lately by the use of magnetic scanning, and usually consists of a gas-filled relay for generating the sawtooth waveform, followed by a pentode output valve for supplying the power to the scanning coils.

G.E.C. RECEIVER MODEL
BT.9121

As a typical example of the layout of a receiver we can take the G.E.C. model which is shown diagrammatically on this page. This has a 12 in. electrostatically con-

trolled tube, but the circuit is representative of that used for both magnetic and electrostatic tubes. The plan view of the chassis shows the layout of the valves and coils, and the lines show the path of the signal

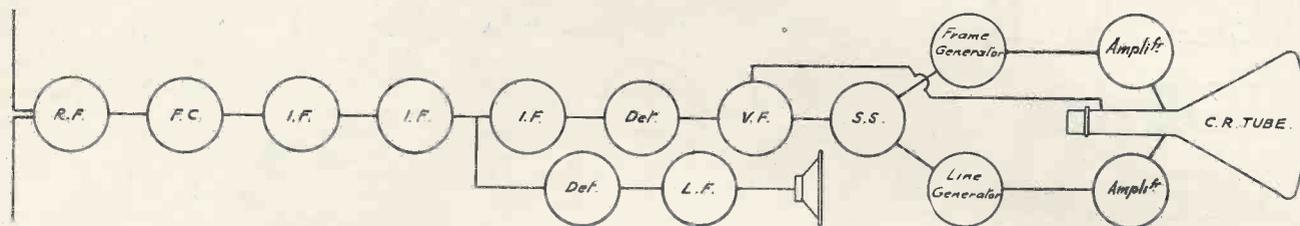
quency of "carrier" for further amplification. At this point a separate tuned circuit is provided for the sound signal and it will be seen branching off to the right to go through another am-

plifier and then to the rectifier. The output from this is fed to a beam tetrode amplifier and thence to the speaker. Returning to the vision signal, after the frequency changer it is

hand corner. These in turn supply the scanning potential to the deflector plates of the tube. In magnetically scanned tubes the coils are connected to the amplifying valves of this circuit, but the layout is the same. We can now see some more typical layouts and note the slight differences. The valves are labelled according to the work they perform:

R.F. is a radio frequency amplifier. I.F. is the intermediate frequency amplifier which follows the frequency changer valve (F.C.). V.F. is the video (vision) frequency amplifier. S.S. is the sync. pulse separator. This valve has various functions, depending on the type of scanning circuit used.

H.M.V. TYPE 907
The arrangement of this receiver is very similar to that just described



Valve line-up of H.M.V. model 907.

through the circuit. In each circle is shown the waveform of the signal as it passes through the valve stages and the gradual increase in size of the wave indicates how it is progressively amplified.

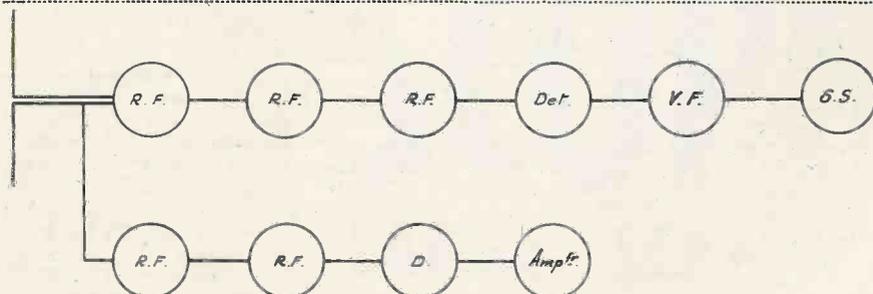
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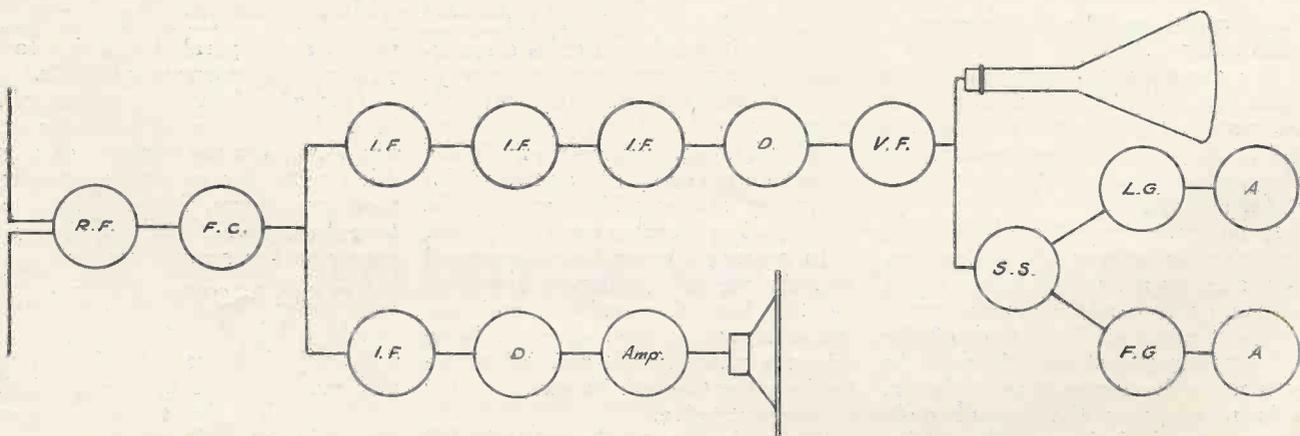


Valve arrangement of Ekco model TA207.

From the aerial, both the sound and vision signals pass through the first two radio frequency amplifiers with their tuned circuits. On the extreme left of the top row is the frequency changer valve which converts both signals to a lower fre-

quency which supplies the grid of the

Further amplified by three I.F. stages (shown on the left in column) and then passes through the diode rectifier at the bottom of the chain. Following the diode is a single video frequency amplifying stage which supplies the grid of the



The Murphy model A56 valve line-up.

in the G.E.C. model. There is one R.F. stage and three I.F. stages, the sound signal being diverted after the second of these.

EKCO MODEL TA.201

This unit is intended for use in conjunction with an existing radio receiver, and there is no loudspeaker. After the detector the sound signal

is amplified by a single stage and is then of sufficient amplitude to be applied to the pick-up sockets of an ordinary radio receiver.

On the vision side there are three R.F. stages instead of the super-heterodyne circuit.

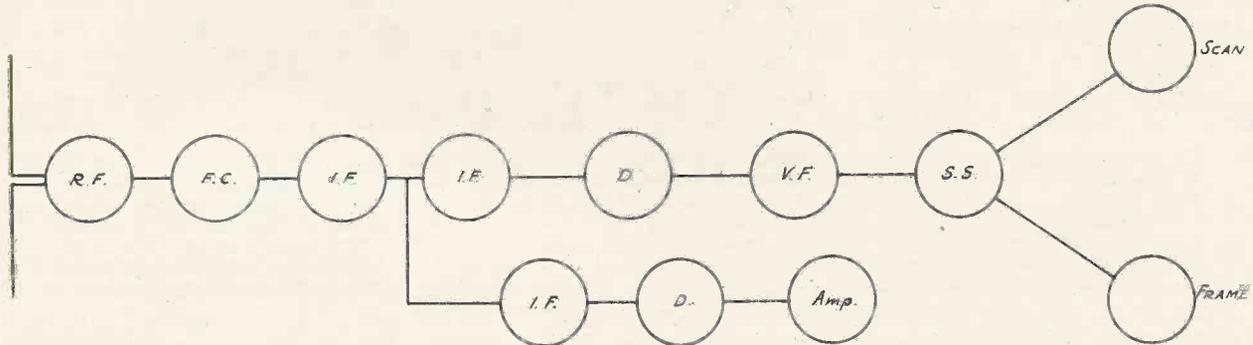
MURPHY A.56

This well-known type is similar in

layout to the circuit which has been fully described. Note the separation of the sound signal after the frequency changer.

COSSOR MODEL 54

One common stage of intermediate frequency amplification is provided and the sound signal then has a separate stage before detection.



The valve arrangement of the Cossor Model 54 receiver.

HINTS AND TIPS FOR NEW SET OWNERS

The position of the receiver should be your first consideration. Although you may not intend to use it regularly during the day time there will be occasions when you will, and you should, therefore, try to place it in such a position that light does not come from the back of the receiver, as this is far more distracting than a small amount of light falling on the screen.

* * * *

Secondly, choose a position so that every time it is wished to view the programmes there is no need to disturb the existing arrangements of the room. Placing the receiver in some corner which necessitates sitting in unconventional places detracts from the enjoyment.

* * * *

Do not pay too much attention to a convenient position for the feeder cable; this can be run practically anywhere and any reasonable distance without detracting from results.

* * * *

If a long mains connection is necessary do not use flex and have it lying across the floor as this is a possible source of danger; it is worth while having a power point put in somewhere reasonably close to the receiver and where children cannot tamper with it.

* * * *

Aerial requirements will depend largely on the distance from the transmitting station. Within a few miles a length of wire 10 ft. 8 in. long will serve but it is always better to use a standard dipole. Dipole aerials are of two main types—with and without a reflector. Up to distances of approximately twelve miles a reflector is not necessary; above this distance it is usually essential for the best results.

* * * *

Whatever the distance from the station there is a certain advantage in using a dipole with reflector as it makes the aerial directional and is

therefore an asset in cutting out a certain amount of interference. At short distances the aerial and reflector should be oriented so that it is non-directional to the source of interference regardless of the position of the station. At long distances, however, it is usually necessary to set it so that it is directional to the station—that is so that aerial and reflector are in line with the station, the aerial being the needle.

* * * *

It is always advisable to experiment with aerial orientation until the best setting is found having regard to signal strength and interference. In many cases it is necessary to effect a compromise.

* * * *

Most interference is from car ignition systems and the best remedy is to erect the aerial as high and as far away from the source as possible. Length and position of the feeder cable is not of much consequence.

* * * *

Aerial height, position and correct setting when a reflector is employed are the main factors to which attention should be given if interference is troublesome. The normal range is approximately 35 miles but it is possible to receive pictures at far greater distances if you are prepared to erect a very high and efficient aerial and use a sensitive receiver. Many manufacturers are now marketing two types—one for local reception and the other for use outside the ordinarily accepted reception area.

* * * *

When the receiver is first installed you will most probably be told not to disturb the preset controls which as a rule are fitted at the back out of the way. This is sound advice but after a time you will most likely find that results can be improved by slight adjustment of these as various characteristics are liable to small changes. Do not, however, attempt to alter more than one of these at the same time and before making any adjustment note carefully

the position so that the original position can be reverted to. If more than one control is altered there is the possibility of considerable difficulty in finding the correct setting again owing to the number of combinations that are possible.

* * * *

Do not switch the receiver off and then on again suddenly. An interval of a couple of minutes should be allowed after switching off before switching on again as in some cases there is risk of injury to the receiver.

* * * *

Vision receivers are not expensive to run; they consume as much as four or even five times as much current as the average domestic radio set, but even so, 200 watts per hour is a good average consumption. With the electricity charged at about 1d. per unit, this means that the television receiver will cost a fifth of a penny per hour.

* * * *

If you already have a good radio set it is not necessary to dispense with this when buying a television receiver. Several manufacturers can supply add-on units which are merely a vision receiver and a short-wave convertor. This is connected in front of your existing wireless set the two working together.

* * * *

Most television receivers are now directly viewed, that is, the picture is seen actually on the face of the tube, however one or two manufacturers still feel that an indirectly viewed receiver has many advantages, particularly when space is of importance. With the indirectly viewed receiver the tube is mounted vertically, and the picture is seen from a mirror fitted at an angle of 45 degrees facing the tube. Choice is a matter of personal preference.

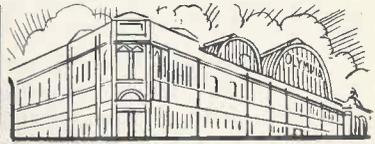
* * * *

The most popular size of picture is 10 ins. by 8 ins. Next comes the 7½ ins. by 6½ ins.; the small one are 5 ins. by 4 ins.

RADIOLYMPIA → 1939

TELEVISION

at Radiolympia



August 23
to September 2
inclusive

SPECIAL REPORT OF TELEVISION EXHIBITS

We present in the following pages a comprehensive survey of television receivers now available to the public. From the number of these it will be apparent that television occupies a very important place at the Radio Exhibition, and this year, for the first time, ownership of a receiver has become a personal matter with a large section of the public. This guide, therefore, will be helpful in enabling a choice of receiver to be made. No attempt has been made to provide technical specifications, but we hope to review many of the receivers in greater detail in future issues. It is of interest to note that compared with last year, there is no indication of any price reduction and there is no indication of such in the future, also, although detail improvements have been made, the basic principles remain exactly the same; the public, therefore, need have no hesitation in buying, either on the question of price reduction or some improbable new development.

BAIRD TELEVISION, LTD.
Crystal Palace, Anerley Hill,
S.E.19. Stand No. 27.

There are six receivers in the Baird range which is very comprehensive. Picture sizes from 7 $\frac{3}{4}$ in. to 12 in. wide are available.

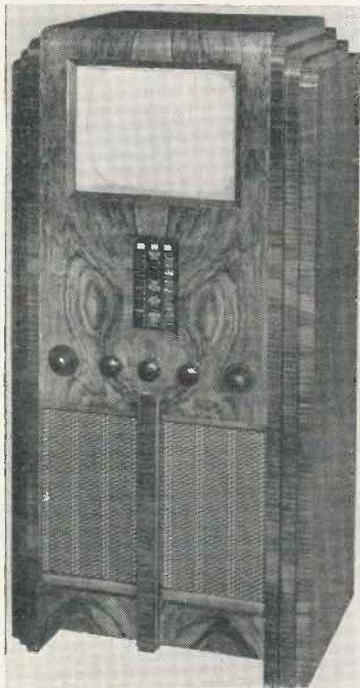
30 gns. Model T.24.—A table

Simple in operation, it is possible, without any technical knowledge, to obtain consistently excellent results. Dimensions: 19 $\frac{1}{2}$ in. high by 15 in. wide by 14 $\frac{3}{4}$ in. deep.

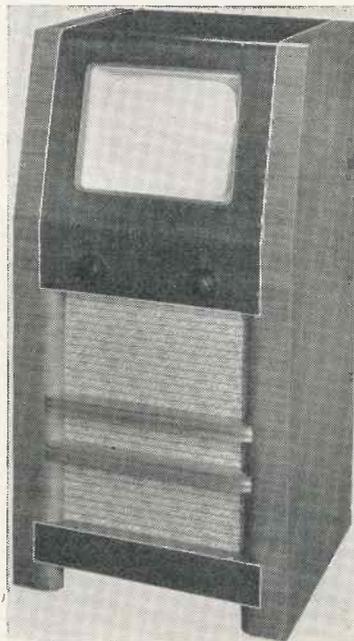
33 gns. Model T28.—This is the console version of Model T24 and incorporates all its many attractive

find a special appeal to flat owners, etc., and where space is an essential consideration.

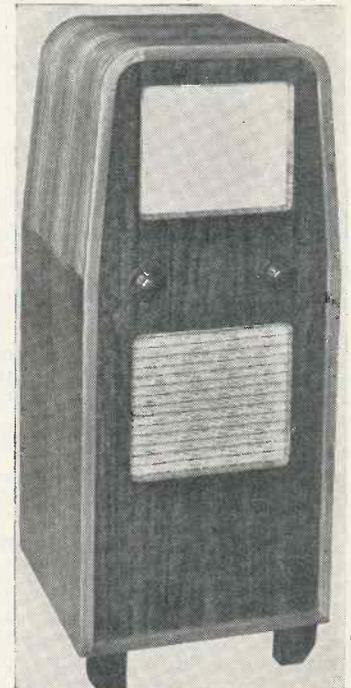
40 gns. Model T26 is the vision and sound receiver complementary to Model T25. The size of the picture is 10 in. wide by 8 in. high and viewed direct. Provision is made for



The Baird T25. A popular size and type at a moderate price.



The Baird T26 television receiver. 10×8 picture at 40 gns.



The Baird T28 at 33 gns. is remarkable value.

cabinet model of very compact design, handsomely finished in burr relieved with straight grained walnut, and incorporating a vision and sound receiver with 9 in. "Cathovisor" tube. The picture is 7 $\frac{3}{4}$ in. wide by 6 $\frac{1}{4}$ in. high and viewed direct.

features. The size of the picture is again 7 $\frac{3}{4}$ in. wide by 6 $\frac{1}{4}$ in. high and viewed direct. The cabinet is very distinctive in design and is constructed of walnut with a facing of Indian laurel. In view of the extreme compactness, this receiver should

receiving television sound only, so permitting the B.B.C. high-fidelity transmission on the television sound wavelength to be received independently of vision. The cabinet is available either in figured walnut or sapeli mahogany. If the latter is

BAIRD

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BEETHOVEN

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COSSOR

desired an additional charge is made of 30s.

47 gns. Model T25.—A combined television and all-wave radio receiver with an excellent performance. The picture is 10 in. wide by 8 in. high and viewed direct on the end of the "Cathovisor" tube. The sound receiver employs a high quality superheterodyne circuit which, in addition to the television sound, also covers three wavebands for radio programmes. (Short: 16-51 metres; medium: 198-560 metres; long: 850-2000 metres). The cabinet is constructed of richly figured walnut. Dimensions: 44½ in. high, 21 in. wide, 16½ in. deep.

48 gns. Model T27.—This attractive receiver, which incorporates a 15 in. Baird "Cathovisor" tube, has been designed for the reception of vision and its accompanying sound, so giving complete entertainment. A picture 12 in. wide by 9¾ in. high is produced and direct viewing is again featured. The handsome cabinet is veneered with choice straight-grained walnut, artistically relieved by selected burr. A special sliding panel is inbuilt, which acts as a screen when, on occasions, overhead room lights are in use. Dimensions: 44½ in. high, 20 in. wide, 22 in. deep.

50 gns. Model T27 (o).—This receiver, finished in oak, has exactly

the same specification and performance as the standard walnut Model T27. It is intended primarily to cater for the special conditions peculiar to schools, clubs, hotels, canteens, etc., and where oak as a finish is more in keeping with the furnishing scheme generally found in such places. Provided with a control lock which prevents unauthorised use. The additional charge for this instrument is £2 2s. Dimensions: 44½ in. high, 20 in. wide, 22½ in. deep.

BEETHOVEN ELECTRIC
EQUIPMENT LTD.

Chase Road, North Acton, London, N.W.10.

The Beethoven range of television receivers comprises two models, which are very similar in specification, the main difference being in the picture size. At the time of going to press the release date for these receivers has not been decided, and consequently, the prices quoted are open to revision.

33 gns. Model BT9.—This is a smaller version of the Beethoven model BT12 described above. The picture size is only 7½ in. by 6 in., but the actual specification is almost identical to the BT12.

43 gns. Model BT12.—A combined television sound and vision receiver in a console type cabinet of contrasting grain and figures French walnut. The picture is provided on a slight incline for ease of viewing, and the size of the screen in this particular model is 10 in. by 8 in. There are three controls—sound-volume and on-off switch, brightness and focus, and the latest type of Mullard short cathode-ray tube is used. Nineteen valves in all are employed, and the consumption is 250 watts. The model is suitable for A.C. mains, and the design of the sound section is such that the sound reproduction is practically indistinguishable from the actual performance.

A. C. COSSOR, LTD.

Cossor House, Highbury Grove, London, N.5. Stand No. 48.

23 gns. Model 54.—Among the Cossor range is the table model 54 at the surprisingly low price of 23 gns. This is a complete self-contained television sound and vision receiver which gives a direct vision picture and uses a 6¼ diameter cathode-ray

tube, giving a picture of approximately 20 square inches.

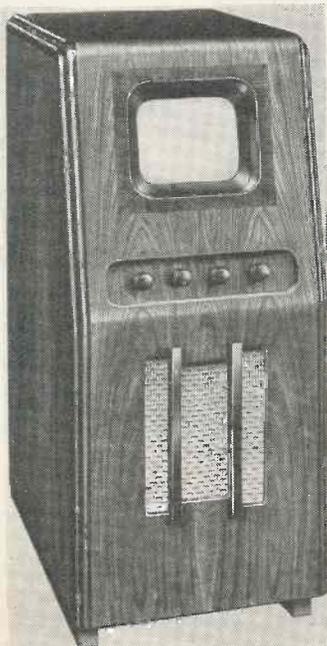
The cabinet, which is of walnut, is 17½ in. high, 13 in. wide and 20½ in. deep, and the receiver is intended for use within a radius of approximately 20 miles from Alexandra Palace. For use at greater distances, a similar model is available incorporating an extra amplifier (16 valves in all) the cost of which is 26 gns.

Only four controls are fitted and the receiver therefore is very simple to operate.

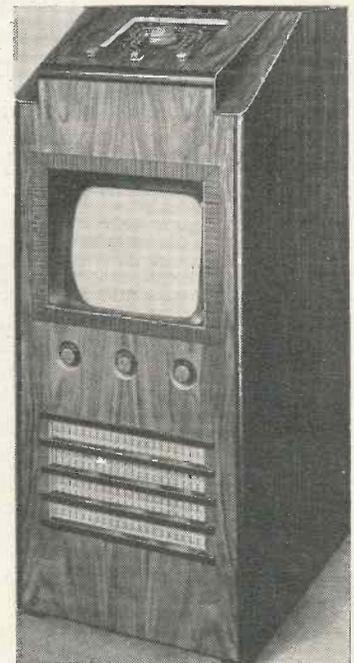
27 gns. Model 65.—This is a console type instrument giving a picture of approximately 6 in. by 5 in. It is for television sound and vision only and the picture is viewed directly on a 7-in. diameter tube.

There are four controls—two for vision and two for sound. Once the correct adjustment has been made these need only rarely be touched. Particular attention has been given to the quality of the sound receiver and the cabinet accommodates a massive 8-in. wide response moving coil loudspeaker, carefully matched with the output stages to ensure the best possible quality of reproduction. Only 13 valves are employed, and the effective range is approximately 20 miles from Alexandra Palace.

The cabinet is walnut, size 34¾ in.



The Cossor 65 is a console model providing television sound and vision only. The picture measures 6 in. by 5 in.



A de luxe television and combined all-wave superhet radio receiver is the Cossor model 1210. The picture provided is 12 in. by 10 in.

COSSOR

DECCA

DYNATRON

high, 15 in. wide and 19½ in. deep. The voltage range is 200-250 volts. For use outside the ordinarily accepted range area a similar model, but employing 16 valves in all, is available at a cost of 3 gns. extra.

53 gns. Model 1210.—This is a de luxe television receiver combined with an all-wave superhet radio re-



Table model 54 made by A. C. Cossor Ltd. This televisor is marketed at the surprisingly low price of 23 gns.

ceiver. The picture provided is one of the largest available; it is 12 in. by 10 in. directly viewed and to give this picture size a 15-in. tube is fitted. Twenty-one valves are employed and a 10-in. energised speaker; covers three wavebands: viz., 16 to 52 metres, 195 to 560 metres, and 810 to 2,085 metres. The cabinet is a console type and measures 48½ in. high, 20½ in. and 24½ in. deep.

As with the other Cossor models, a modified type of this receiver employing 24 valves in order to give extra power for distances in excess of 20 miles from Alexandra Palace is available. The price of this is 56 gns.

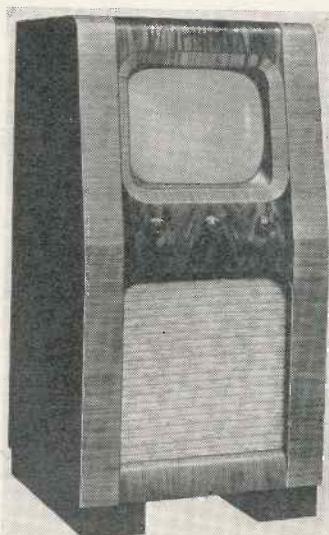
It is understood that an additional console receiver is in the course of design, but particulars are not available at the present time.

DECCA RADIO & TELEVISION, LTD.

1-3 Brixton Road, London, S.W. Stand No. 44.

The Decca Company have concentrated on two models, both of the console type, one incorporating all-wave press-button radio and the other being for television sound and vision only.

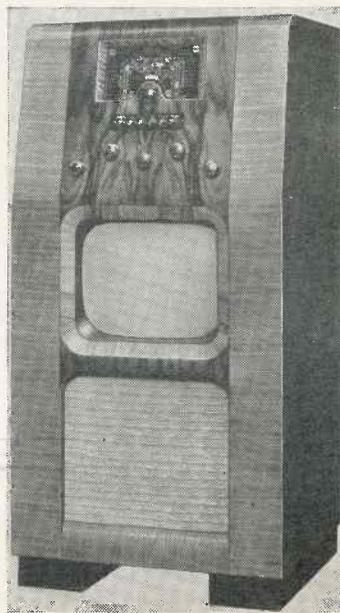
39 gns. Model 39.—This is a



This photograph shows the Decca model 39, a console type televisor which provides a picture 10 in. by 8 in.

console model providing a picture 10 in. by 8 in. and employs 19 valves with a power consumption of 150 watts. The television section of this receiver is identical with the model 46 described below. The cabinet size is 35 in. high by 17 in. deep and 18 in. wide.

46 gns. Model 46.—This is a combined television receiver and all-wave press-button radio, covering three wavebands, viz: 16 to 50, 200 to 550, and 1,000 to 2,000 metres. The mechanical method of press button tuning is employed, and any



Another Decca receiver, but this model (the 46) includes an all-wave press-button radio in addition to television sound and vision.

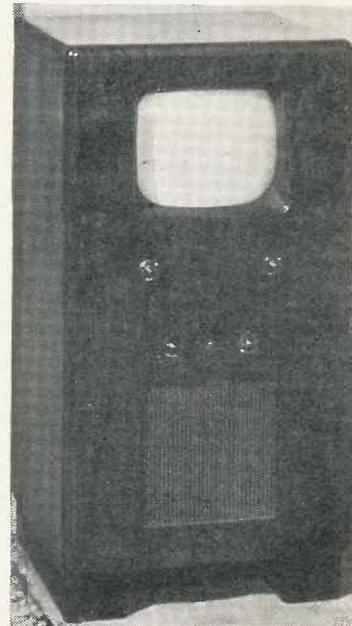
button may be re-set to a new station in a few seconds.

In all, 22 valves are used for vision and radio, and for the complete instrument there are seven controls which include the press buttons giving a choice of any eight broadcast stations. The voltage range is 200 to 250 volts and the current consumption is 200 watts. The circuit comprises an R.F. stage for sound and vision with a common mixer stage for both. The sound output is 4½ watts. The cabinet is of walnut 41 in. high, 17 in. deep and 20 in. wide, and the picture is viewed direct.

DYNATRON RADIO LTD.

Perfect Works, Ray Lea Road, Maidenhead, Berks. Stands Nos. 1 and 39.

The Dynatron range of television receivers comprises three models. A 12-in. tube is employed, and the high quality of construction renders the Dynatron receiver suitable for satisfactory reception over long distances. The makers claim that successful installations have already been made in Gloucestershire, Norfolk and the South Coast



The Dynatron Falcon.

175 gns. Model 4518 (The Ether Emperor IV).—A large screen television receiver in which is incorporated, in addition to television sound and vision, a very sensitive all-wave radio receiver and an auto-changer radiogramophone. Forty-five valves are used and the output is 18 watts. This model is housed in a large walnut cabinet.

Visit

RADIOLYMPIA

Aug. 23rd—Sept. 2nd

1939

Special Attractions

for the technically minded amateur

This year's Radiolympia will have considerably more interest for the techni-fan.

Model Factory

The model factory, working under actual practical conditions, will show almost every process of radio manufacture—such as coil winding, wire covering, wire joining, grid making, spring making, R.F. Coil adjusting, resonance test, impedance comparison, inductance comparison, ganged condenser testing, cutting and forming wires of tubular condensers, engraving, test and assembly and dry battery manufacture. Experts will be in attendance to explain these processes, and to deal with any difficulties, such as interference, "fading," etc., to the serious-minded amateur. In addition, there will be a revolving drum, showing the complete chassis of many of the leading manufacturers' sets.

Technical Conventions

Technical conventions will be held in the Convention Hall on the four days August 28th to August 31st, inclusive. The following subjects will be discussed by experts, and the meetings will be open for general discussion.

- (a) Short-wave technique.
- (b) High quality reproduction.
- (c) Television.
- (d) General technical topics.

Many distinguished visitors will attend and address these meetings.

Radio Theatre

The radio theatre at Olympia, specially built at a cost of over £5,000, is a replica of the famous "bowl" theatre at Hollywood, and is the *first theatre in the world* to be designed and constructed expressly for broadcasting AND TELEVISION.

Broadcasting and Televising Every Day

See the batteries of cameras and microphones at work in the hands of the full staff of B.B.C. experts.

TELEVISION

Television is the keynote of Radiolympia 1939. Apart from the 64 sets constantly working in "Television Avenue," literally HUNDREDS of sets will be receiving continuously throughout the exhibition . . . This is the greatest demonstration of television the world has ever seen.

Come and Be Televised Yourself

Special facilities for organised technical parties

Please apply to Secretary for particulars of reduced price tickets, Convention tickets, etc.

Radio Manufacturers' Association

59, Russell Square, London, W.C.1

Telegrams: QIDARION, Westcent, London

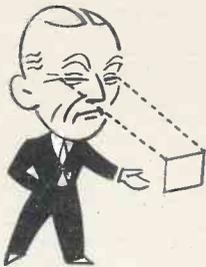
Phone: MUSEum 4031

*It will
have to be*

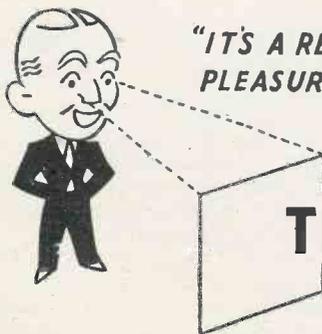
SCOPHONY

AS AGAINST
'SMALL' SIZE
VIEWING...

LARGE SCREEN TELEVISION



... THE SCOPHONY
LARGE SCREEN



"IT'S A REAL
PLEASURE"

You would *not* use to-day a Crystal Set and ear-phones! Similarly, the future of Television is the LARGE home screen. Here Scophony are YEARS AHEAD! Only Scophony Home Television gives so high a standard of brightness on so large a screen with such simplicity. Write for details of Scophony Large-Screen Home Receivers—Screen sizes : 18 inch, TWO FOOT, and Palace de-Luxe FOUR FOOT—to Scophony Ltd., Thornwood Lodge, Campden Hill, London, W.8.

TELEVISION WITHOUT EYESTRAIN

EKCO

::

FERRANTI



A 19-valve table television receiver with a 6¼ in. by 5 in. picture is the Ekco model TS701. The four main controls are Focus Brightness, Contrast and Volume/On-off switch.

69 gns. Model TV23 (Falcon).—This is the newest Dynatron model. It is a console type receiver providing television sound and vision only. A 12-in. cathode-ray tube is employed, and there are 23 valves in all.

130 gns. Model M358 (Ether Monarch).—This is a modified version of the model 4518 described below. There are only 35 valves in all, and a less elaborate radio receiver is incorporated.

E. K. COLE, LTD., (EKCO)

Southend-on-Sea, Essex. Stand No. 47.

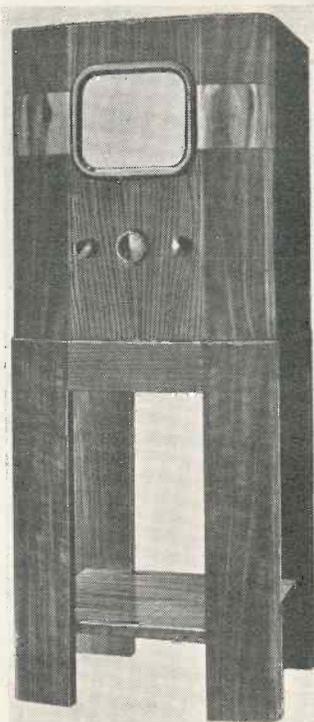
There are four models in the Ekco range, two of these being add-on units, that is the instruments provide vision only, but a convertor is incorporated so that they can be used in conjunction with any ordinary broadcast set with the provision of television sound.

22 gns. Model TA201 provides a picture of 6¼ in. by 5 in. and this low figure brings television practically within reach of all. Control is exceedingly simple and in these units there are only three, contrast, brightness and focus, that need be touched; tuning is fixed. The cabinet size is 19½ in. by 17 in. by 16 in. and is of polished walnut. A stand is available at 2 gns. extra.

25 gns. Model TA901.—The general specification of this instrument is the same as model TA201, but it provides a larger picture, viz: 7½ in. by 6 in. The sound output is 3 watts and the cabinet is slightly larger; this also, of course, is intended to be used in conjunction with

a broadcast receiver for the provision of sound.

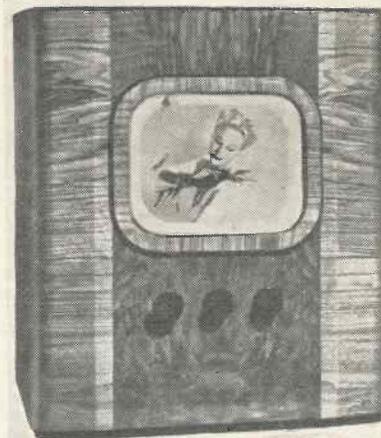
26 gns. Model TS701.—This is a complete sound and vision table-type instrument giving a picture 6¼ in. by



Another add-on unit by Ekco. The picture size is 6¼ in. by 5 in., and the stand is available at 2 gns. extra.



The model TSC902 by Ekco gives a picture 7½ in. by 6 in. The specification of this receiver is similar to the TS701.



The Ekco model TA901. This is an add-on television unit providing a picture 7½ in. by 6 in.

5 in. Nineteen valves are employed and the sound output is 3 watts. Four controls, focus, brightness, contrast and volume-on/off, are at the front of the cabinet. The cabinet is of walnut and measures 21½ in. by 17 in. by 16 in.; a stand is available at 2 gns. extra.

30 gns. Model TSC902.—A console model giving a picture of 7½ in. by 6 in., and the sound output is 3 watts. Four controls are provided as with the model TS701 and the general specification is the same but with increased picture size. The cabinet is of walnut, 38 in. high by 19 in. wide and 16 in. deep.

FERRANTI, LTD., RADIO WORKS

Moston, Manchester, 10. Stand No. 41.

Three receivers comprise the Ferranti range, these being a table television, a console television and an all-wave television.

30 gns. Model T10.—This is a table model giving a picture 7 in. by 5¼ in. and will receive both vision and the accompanying sound. The picture is viewed directly and the tube, which is of the magnetic type, is protected with a special glass, which can be moved quite easily for cleaning when necessary.

Three controls are provided, line hold, combined sound volume and on-off switch, combined brightness and television on-off switch. Provision is made for an extension speaker and gramophone pick-up connections are also provided. The cabinet is of walnut, 17 in. high, 20¼ in. wide, and 15 in. deep.

40 gns. Model T8.—A console

FERRANTI

::

G.E.C.

receiver for vision and sound only, giving a picture 10 in. by 8 in., which is viewed directly. Provision is made for an extension speaker, and the cabinet is of walnut, 45 in. high, 19 in. wide and 19 in. deep.

48 gns. Model T9.—The television section of this receiver is essentially the same as the model T8, but in addition there is incorporated an all-wave broadcast receiver, which comprises a 5-valve, three-waveband superhet covering 16.5 to 51 metres, in addition to the long and medium wavebands.

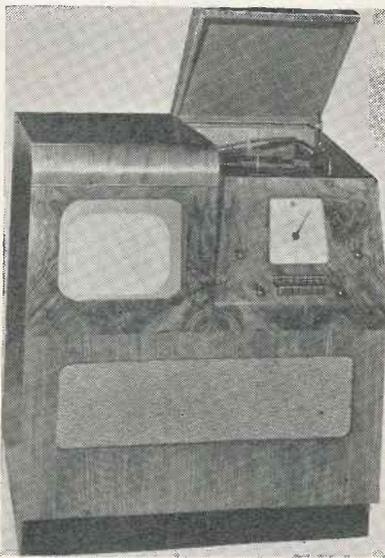
The cabinet dimensions are 45 in. high, 19 in. wide and 19 in. deep.

THE GENERAL ELECTRIC CO., LTD.

Magnet House, Kingsway, London, W.C.2. Stand No. 35.

Pre-set thermo-constant tuning, a vision interference limiter, electromagnetic scanning, electrostatic focusing, a built-in attenuator, and a safety mains lock are also included in the specification of this and the other receivers in the G.E.C. range.

22 gns. Model BT.0070. For those who already have a good radio set there is Model BT.0070, inexpensively priced at 22 gns. This receiver is compactly housed in a walnut cabinet finished in light and dark contrasting bands. The overall measurements are height 18½ in., width 14¼ in. and depth 14½ in. There are four external controls consisting of the mains switch, brightness control, contrast control, and focus



G.E.C. BT.0124. Television and all-wave radio-gramophone. 72 gns.

adjustment. To guard against current wastage and unwanted tube depreciation, a green pilot light is fitted. The picture given by a 7 in. Osram tube is 6 in. wide and 4¾ in. deep. The 15-valve superhet circuit consumes 180 watts and is therefore extremely economical in operation.

A Family Console

32 gns. Model BT.0091 is a console which at 32 gns. is excellent value. The dimensions are height 39 in., width 25¼ in., and depth 15½ in. In addition to the external controls for picture brightness and contrast, sound volume and tone quality, there are three push-buttons. The first switches on the sight and sound channels, and the second brings in sound reception only. The other button switches the set off. The picture, which is provided by an electromagnetic 9 in. Osram tube, measures 7½ in. by 6 in.

A 16-valve superhet circuit is employed, consuming 235 watts when used for sight and sound, and 115 watts when operating on the sound channel only. Provision is made for the connection of both extension speaker and gramophone pick-up.

A Luxury Receiver

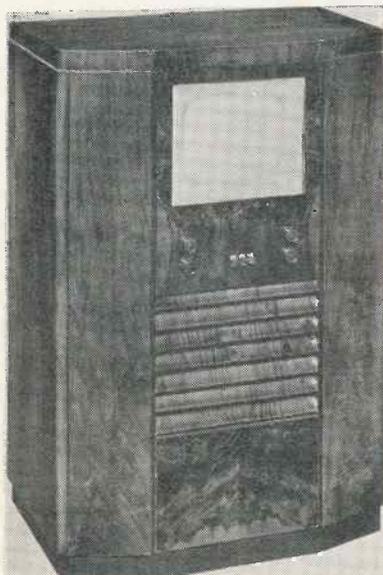
40 gns. Model BT.0092. For only another 8 gns. G.E.C. model BT.0092 is available for those who wish to have all-wave radio and television in one instrument. This receiver is similar in appearance and general specification to model BT.0091. In addition to the controls

on the latter, however, there are fifteen push-buttons, including one for each of the wavebands, viz., 16.5-50 metres, 192-550 metres, 1,000-2,000 metres, another for the pick-up circuit, and eight for the selection of any eight stations. G.E.C. push-button control is a mechanical system giving great stability and simplicity of operation.

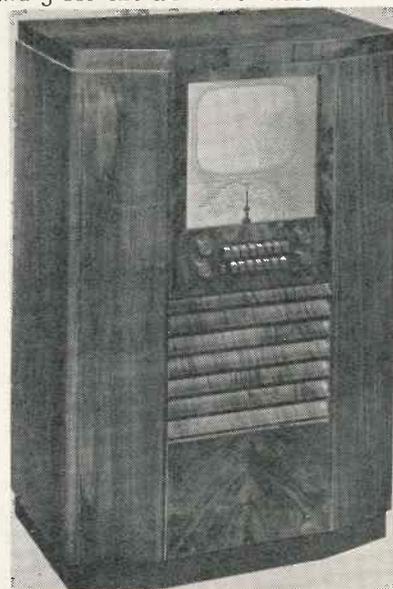
The circuit is a 17-valve superhet having a power consumption of 235 watts for sight and sound, 115 watts when used for television sound only, and 125 watts on radio.

72 gns. Model BT.0124. The last of the series of four G.E.C. sets was actually introduced in June, the others being shown for the first time at Radiolympia. This is a de-luxe receiver combining television, radio, and an eight-record autogram. The handsome walnut cabinet is 38½ in. high and covers a floor space 33½ in. by 23½ in. The picture which measures 10 in. by 8 in., is produced by a 12 in. Osram electrostatic tube. Both vision and radio manual controls and push-buttons are the same as for model BT.0092, as are the wave ranges covered, the loud-speaker, and other details of the specification.

In this receiver, instead of the components being mounted on one chassis, there are separate units for vision, sound, power, timebase and radio. Both scanning and focusing are electrostatic. The circuit incorporates 23 valves, 18 for television, and 5 for the all-wave radio.



G.E.C. BT.0091. Television console. 32 gns.



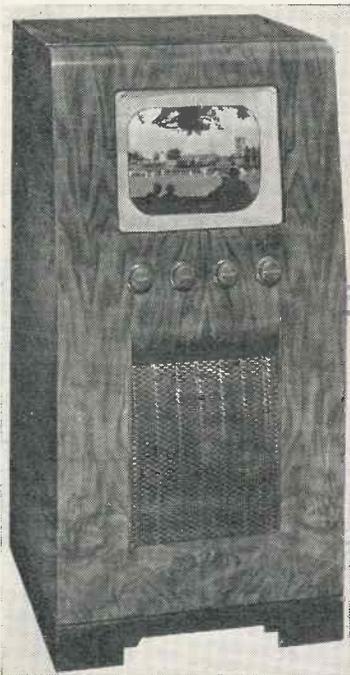
G.E.C. Television and all-wave radio console BT.0092 40 gns.

H.M.V.

GRAMOPHONE CO., LTD.
(H.M.V.)

98/108 Clerkenwell Road, London.
Stands Nos. 46 and 53.

The H.M.V. range of television and combined television and radio receivers comprises seven models, four of which are entirely new superhets,



A console type model by H.M.V., the 1801 provides a picture size 6 5/8 in. by 8 3/8 in.

with which two different picture sizes are available. It will be of interest to consider some of the special features which are common to all the new H.M.V. models, and to this end a block diagram of the circuit is reproduced here.

A common superhet for both vision and sound is employed, the first H.F. valve being the new Z62; the frequency changer a triode-hexode X41C which is followed by two tuned grid I.F. amplifiers employing KTZ41 valves. The next stage of I.F. amplification, also a KTZ41, operates for vision only, and the "sound rejector" circuit ensures the freedom of this channel from any residual sound signal. The sound section of this signal is passed via a coupling coil to the separate I.F. stage which feeds a double diode triode, the various sections of which have the following uses. One diode is for demodulation. The triode is an I.F. amplifier feeding the output valve via the volume control. In the anode circuit of the output valve a

hiss limiter is connected. The other diode is connected so that it feeds an out-phase signal to the channel to cancel out sound interference.

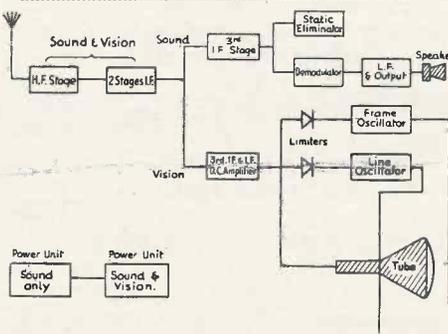
The vision and synchronising signals up to the third I.F. stage are passed to a D43 for demodulation. The demodulated signal is then amplified by a KTZ41 in the anode circuit of which is connected the cathode of the cathode-ray tube from a limiting diode. This, in conjunction with a KTZ63, takes charge of the line synchronising signal and passes it to the line oscillator.

Similarly the other diode passes the frame pulses to the frame oscillator. An electro-magnetic tube is employed and a new technique enables a flatter end to be provided, and therefore use is made of the maximum area for the picture. A light stone coloured rubber mask is employed round the tube. The following are brief specifications of receivers in the H.M.V. range.

31 gns. Model 1800.—This is a particularly simple type of receiver in a table-type cabinet with only two front controls—picture brightness and sound-volume. It provides a picture 8 3/8 in. wide by 6 3/8 in. deep. Cabinet dimensions are: height 21 3/8 in., width 15 3/4 in. and depth 18 in., with a 2 3/4 in. projection at the back.

35 gns. Model 905.—This is a combined radio and television receiver of the table type. The picture size is 6 1/4 in. by 5 in. and the instrument comprises a three-waveband radio receiver and a vision receiver. It is a particularly compact instrument as the dimensions are only 19 1/8 in. high, by 26 in. wide by 14 1/2 in. deep, with a 3 1/2 in. projection at the back. This is the model which was introduced last year and proved very popular.

36 gns. Model 1801.—This instrument is essentially the same as the model 1800, but is fitted into a



Schematic diagram of H.M.V. receivers.

console cabinet. The picture size is the same, viz: 6 5/8 in. by 8 3/8 in., the cabinet size is 38 1/4 in. high, 18 in. wide and 19 3/8 in. deep. Again there is a 2 3/4 in. projection at the back.

44 gns. Model 1802.—A console model which provides a picture 11 5/8 in. by 9 3/8 in. Sound and vision are



A console type receiver is the H.M.V. 1850. The picture size is 11 5/8 in. by 9 3/8 in., and in addition, an all-wave push-button radio is provided.

pre-tuned and there is provision for an extra amplifier. The sound output is 5 watts and the mains current consumption for sound and vision is 215 watts. This is a very suitable instrument for viewing at a distance of 8 ft. or 10 ft., and it is, therefore, more accommodating in cases where a number of people wish to see the programmes.

45 gns. Model 907.—This is a combined television and radio receiver giving a picture 6 in. by 7 1/2 in. It is a console model with a cabinet 39 3/8 in. high, 17 3/4 in. wide and 22 3/4 in. deep, with a 3 1/2 in. projection at the back.

57 gns. Model 1850 has the same television specification as the model 1802 (picture size 11 5/8 in. by 9 3/8 in.), but in addition all-wave push-button radio is provided. The radio receiver covers three wavebands 13.8 to 50 metres, 195 to 580 and 725 to 2,000 metres. It has an electronic tuning device and gramophone pick-up sockets are provided. The consump-

MARCONIPHONE

::

PHILIPS

tion is 285 watts for sound and vision and 70 watts for broadcasting.

80 gns. Model 900.—A de luxe instrument which follows an original design which in the past has been very popular. The picture, which is 10 in. by 8 in., is viewed indirectly in a mirror in the lid of the cabinet. The instrument combines television and a four-waveband radio receiver, and the performance of the latter, particularly on the short-waves, is of a very high order. The cabinet dimensions are 38½ in. high, 36 in. wide, and 19½ in. deep.

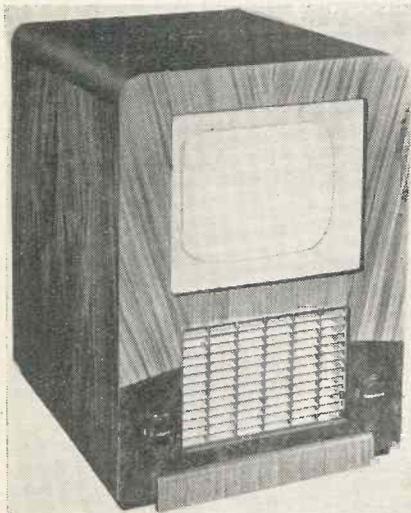
MARCONIPHONE CO., LTD.

210, Tottenham Court Road, W.1.
Stand No. 36.

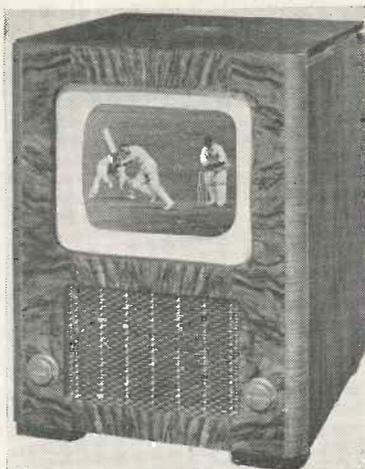
31 gns. Model 710 is a table television sound and vision receiver, incorporating a 10-in. Emiscope tube giving a picture 6½ by 8½ in. Only two operating controls are provided for volume and brightness, and both sound and vision are pre-tuned, but pre-set controls are provided for initial adjustments.

Size is 21½ in. high, 15¼ in. wide and 18 in. deep. The mains consumption is 215 watts.

35 gns. Model 707.—This is a table model television and three waveband radio receiver, employing a 7-in. all magnetic tube giving a picture 5 in. by 6¼ in. A feature is the use of two independent mains transformers for purposes of current economy when it is desired to use the sound section of the instrument



The Marconiphone model 710 giving a picture 6½ in. by 8½ in. A noise suppressor circuit is incorporated in this receiver, and provision is made for an extra amplifier if it is desired to use the televisor outside the ordinary service area.



The new H.M.V. model 1800 table television receiver. It has a screen 8½ in. by 6½ in., and the two controls are picture brightness and sound-volume.

only. This model also can be had with an auxiliary amplifier at the cost of £1 5s.

There are provided external speaker and pick-up sockets. The dimensions are height 18½ in., width 26 in. and depth 14½ in. The current consumption is 200 watts for television and 85 watts for broadcast radio.

36 gns. Model 711.—A console model for television sound and vision with practically the same specification as model 710 described above. The cabinet size, however, is height 38½ in., width 18 in. and depth 19½ in.

44 gns. Model 712. This is a console model television sound and vision receiver incorporating a 14-in. tube which provides a picture 9½ in. by 11½ in. The specification is similar to model 711 except that a larger picture is provided. The cabinet size is 39½ in. high, 19½ in. wide and 23½ in. deep.

45 gns. Model 709.—A console model television and three waveband radio receiver, employing a 9-in. tube, and giving a picture 6 in. by 7½ in. The height of the cabinet is 39 in., width 18 in. and depth 23 in.

57 gns. Model 713.—Television, sound and vision and 6-valve three waveband push-button console. The television section specification of this receiver is the same as the model 712 but the instrument in addition incorporates a three waveband push-button control radio receiver

Cabinet size is 48 in. high, 21½ in.

wide and 23½ in. deep. The mains consumption for television and sound is 285 watts, broadcasting 70 watts.

80 gns. Model 705.—This is a de-luxe instrument combining television, (sound and vision) and four waveband radio receiver. A 12-in. tube is used, giving a picture size 10 in. by 8 in. An automatic waveband indicator, external speaker and pick-up sockets are provided.

MURPHY RADIO LTD.

Broadwater Road, Welwyn Garden City, Herts. Stand No. 33.

At the time of going to press details of the Murphy television exhibits were not available.

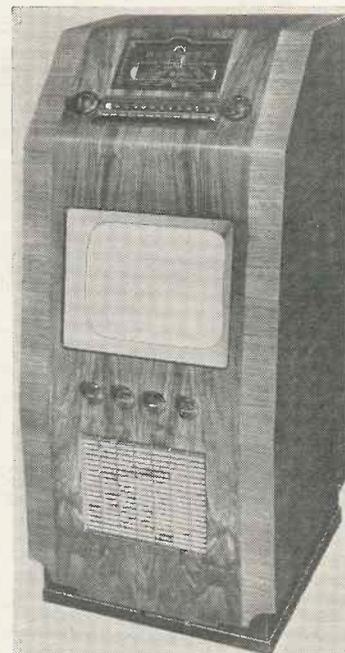
PHILIPS LAMPS, LIMITED

Century House, Shaftesbury Avenue, W.C.2. Stand No. 45.

Philips Lamps, Limited, have produced four new receivers—one table and three console models; they differ from each other only in the size of the picture and the fact that two of them incorporate an all-wave radio receiver with Philips' automatic tuning in addition to the television sound.

Fourteen valves are used in the television models, and 18 in the television and broadcast models.

32 gns. Model 2405 is a horizontal table model giving vision and sound accompaniment. The picture



A console type receiver by Marconiphone is the model 713. In addition to providing television sound and vision a 6-valve 3 waveband, push-button radio receiver is incorporated.



THREE WORDS...

That mean so much to you!

In the whole vast field of home entertainment, three words have always been outstanding "His Master's Voice."

To-day that name leads in a new field of achievement—Television, and here "His Master's Voice" engineers are in a unique position.

They are not only fully conversant with the developments in transmission technique, but over the past three years have amassed an unrivalled fund of detailed information, on the score of what best will reproduce the programmes sent out from Alexandra Palace under reception conditions of the widest possible variety.

This intensive field research manifests itself in the 1940 "H.M.V." receivers in many exclusive features.

Take an early opportunity of examining them at your "His Master's Voice" dealer's. He is specially qualified to advise you.

'HIS MASTER'S VOICE' Television

'CLEARLY' THE BEST!

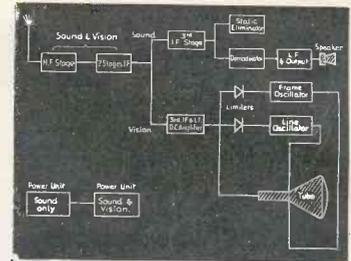
★ COUPON

To "His Master's Voice," 98-108, Clerkenwell Road, London, E.C.1
I should be glad to receive a copy of your booklet illustrating the complete new range of
"His Master's Voice" Television Receivers.

NAME

ADDRESS

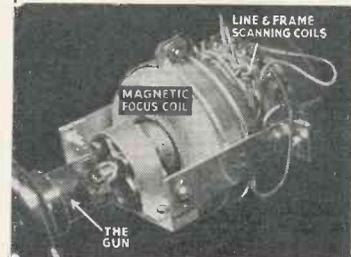
Tel. Sept. :



Block circuit diagram of the arrangement of the new "His Master's Voice" Television receivers. The high efficiency H.F. stage gives very high sensitivity and the arrangement of the line and frame oscillators ensures constant locking of the synchronising circuits.



The new Z62 H.F. valve as employed in the H.F. stages of the new "His Master's Voice" Television receivers owes its high efficiency in a large measure to the compactness of its design and the very stable electrode arrangement.



On the neck of the cathode ray tube in the new "His Master's Voice" Television receivers is supported this unit, which ensures the accuracy of focus and also provides the magnetic fields for line and frame scanning.

OTHER FEATURES INCLUDE

- ★ Phase reversal sound interference suppression.
- ★ Triode Cathode ray tube.
- ★ Accurate transient amplification and wide band I.F. circuits.

Before you buy an oscillograph

—or any other instrument....



THIS season manufacturers will require their dealers to have first-class servicing facilities. The public, too, will be guided to a large extent by the confidence they can place in their suppliers. For these reasons a well-equipped service department has become a vital necessity.

No matter how well your equipment has served you in the past, now is the time to consider seriously whether it is complete, and whether it is good enough for the future.

1. They are actual users of apparatus in their own factory and service department.
2. Their range of equipment covers all radio and television servicing requirements and is acknowledged to be the most efficient and reliable that can be obtained.
3. They have one of the finest Radio and Television training schools for service engineers in the industry.
4. They have a staff of service experts calling regularly on Radio

* Radio and Television Servicing with Cathode Ray Oscillographs G.M.3152 and G.M.3155, Price 2/6 net.

You may already be thinking of a cathode ray oscillograph, a new oscillator or valve tester.

Before you decide, why not seek the advice of the organisation which has pioneered retail Service in this country and has the biggest reputation for efficient and dependable apparatus? Mullards offer all dealers the benefit of their vast experience in the design and application of modern service apparatus. They are the only organisation fully equipped to do this because:—

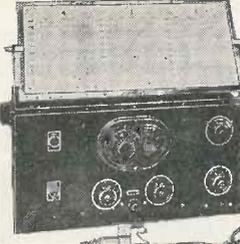
5. They have specially produced for service engineers a practical and comprehensive guide to the uses of the Cathode Ray Oscillograph *.
6. They have organised the biggest and most consistent service development campaign in this country.
7. They spend big sums annually in telling the public about service.
8. They have already equipped and advised well over 1,000 dealers.

Dealers. They are the only firm who do this.

Mullard

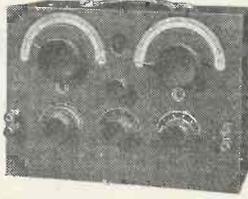
WIRELESS SERVICE COMPANY LTD.
CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2
PHONE: GERRARD 7777

Cathode Ray Oscillograph Type G.M.3155.
(The G.M. 3152 is illustrated above.)

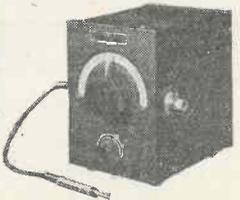



Service Signal Generator Type G.M.2880F.

Mullard Master Test Board Type 7629. Combined Valve Tester and Set Analyser.

Audio Frequency Oscillator Type G.M.2304.



Frequency modulated Oscillator Type G.M.2881.

Pye :: R.G.D.



The Philips projection receiver giving a picture 18 in. by 14½ in.

size is 7¼ in. by 5¾ in. The dimensions of the cabinet are 24½ in. wide, 16½ in. high and 14½ in. deep with a projection of 2¼ in. for the end of the cathode ray tube.

35 gns. Model 2407. A console model giving a picture 7¼ in. by 5¾ in. with sound accompaniment of high quality. The cabinet measures 19¼ in. wide, by 32¾ in. high by 12¾ in. deep, plus a projection of 3¾ in. for the end of the cathode ray tube.

45 gns. Model 2412. A model similar in its main features to the 2407, but incorporating in addition the latest Philips 5-valve all-wave radio receiver with Philips' automatic tuning, giving television or ordinary broadcast programmes at will. The picture size is 7¼ in. by 5¾ in.

55 gns. Model 2415. This is the de luxe model of the new range, giving a picture 10 in. by 8 in. It incorporates a 5-valve all-wave receiver of advanced design, with Philips' automatic tuning and many other refinements.

120 gns. Model TEL 61. A large screen receiver incorporating Philips' picture projection system employing high-definition 4 in. cathode-ray tube. The picture size is 18 in. by 14½ in., and the model includes a 7-valve all-wave broadcast receiver chassis with motor driven press button tuning.

PYE, LTD.

Radio Works, Cambridge. Stand No. 32.

Pye Limited have introduced four new models, but the existing models are also being retained. The new models are as follows:—

32 gns. Model 9C.—A console receiver giving a picture approximately 7½ in. by 6 in.

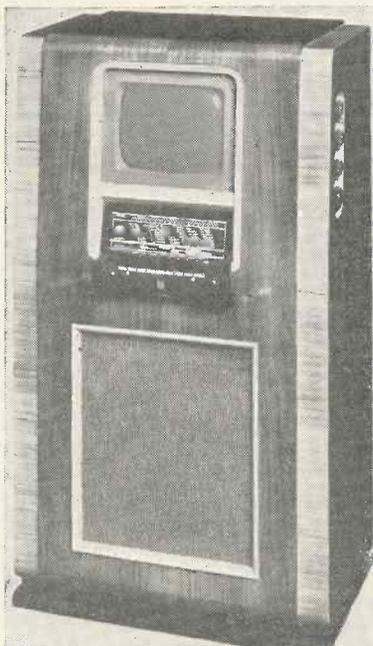
39 gns. Model 12C.—A console receiver with a picture size 10 in. by 8 in.

47 gns. Model 12CR.—Similar to the model 12C but incorporating an all-wave radio receiver.

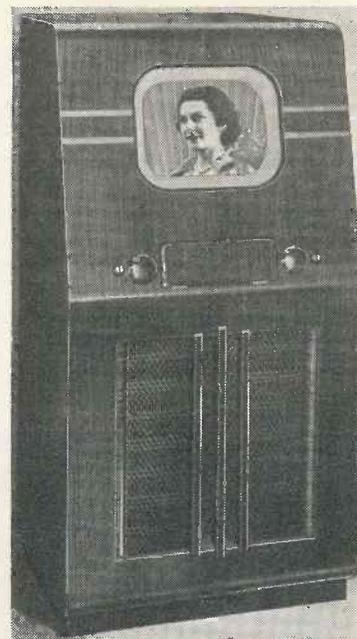
70 gns. Model 12RG providing a picture 10 in. by 8 in. and incorporating an auto-changer radiogram and all-wave radio.

The principal features in the Pye range of receivers are very similar. All of them include a synchronising stage of exclusive design which is entirely automatic, thus ensuring a perfectly steady picture without the need of adjustments. Another feature incorporated in the sound section is a noise suppression circuit which reduces to a considerable extent noise resulting from car ignition systems. The power consumption when both vision and sound sections are in operation is 200 watts, and that of the sound section alone is 60 watts.

Models 9C and 12C employ 17 valves, and models 12CR and 12RG 21 valves. All subsidiary controls are in front of the cabinet behind a panel between the two main controls.



Philips model 2412—television and all-wave radio.



Pye model 9C priced at 32 guineas.

RADIO GRAMOPHONE DEVELOPMENT CO., LTD.

Globe Works, Newtown Row, Birmingham, 6. Stand No. 29.

45 gns. Model 391. A 9-in. cathode-ray tube is employed, giving a directly-viewed picture 7½ in. by 6 in. The picture is on an inclined panel at a suitable angle for viewing.

The circuit is a 22-valve super-heterodyne vision and sound receiver with H.F. stage for vision and sound, separate oscillator and mixer valves, e.i.f. stages, diode second detector and video stage for vision, DDT valve and 5-watt tetrode for sound.

51 gns. (approx.). Model 393. The specification is the same as Model 391 except that a 12-in. cathode-ray tube is used giving a directly-viewed picture, 10 in. by 8 in.

75 gns. Model 391. R.G. The television specification is the same as model 391, but all-wave radio is included, consisting of a 6-valve 9-stage superheterodyne receiver operating on three wavebands; with fully automatic permeability push-button tuning on six stations, and also an automatic record-changer with magnetic pick-up.

130 gns. Model 392 R.G. employs a 12-in. cathode-ray tube giving a picture 10 in. by 8 in.

SCOPHONY

::

INVICTA

viewed through mirror in the lid. Independent television and radio is provided permitting ordinary radio programmes in one room, television in another. An automatic record-changer is included to play, or reject at will, eight 10-in. or 12-in. records mixed in any order. The cabinet is walnut, and all controls are mounted under the lid. The television receiver employs a 23-valve superheterodyne vision and sound receiver, and the radio circuit consists of an 11-valve 15-stage superheterodyne receiver operating on four wave-bands.

controls being provided for vision and one control for sound.

An 18 in. receiver having built-in 10 valve all-wave push-button radio is also available.

Two Foot Receiver.—The 2 ft. receiver, an earlier model of which was shown at last year's Radiolympia, has since been considerably improved. This receiver has the high standards of brightness and definition achieved of the 18 in. receiver. As in the case of the 18 in. receiver the screen is built into the cabinet. This receiver is intended for the more spacious type of room available

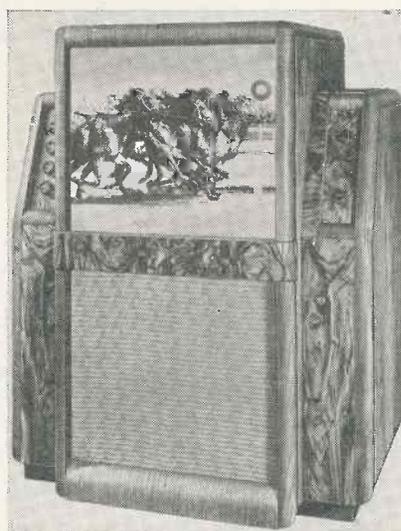
ture can be operated by remote control.

As in the case of the other Scophony home receivers a super high-pressure mercury lamp, a product of the Scophony laboratories, is for the light source. The picture is projected from the rear on to a portable screen, and the sound is adequate for any size of room in which this receiver might be used.

Film Transmitters.—Scophony are also showing their latest type of film transmitter. The particular model is designed to work on 441 lines 60 frames a second, which is the



Of very special interest are the Scophony receivers as they are the only mechanical-optical type available. Above is the 4 ft. projection receiver and on the right a homes receiver giving a 2 ft. picture.



This is the Invicta model TL8.

SCOPHONY LIMITED

Thornwood Lodge, Campden Hill, W.8. Stand No. 49.

Scophony receivers are notable for the comparatively large pictures they produce, the smallest picture size being 18 in. by 14 in., while the largest is 4 ft. by 3 ft.; all utilise the Scophony optical-mechanical projection principles.

18-inch Receiver.—An entirely new development is this home receiver which gives a picture 18 in. by 14½ in. on a perfectly flat screen. The brightness is very high and the picture can be viewed with little less than ordinary room lighting. The picture is black and white and of excellent definition. The picture screen is built into the cabinet making a very attractive ensemble. This receiver is suitable for any size of living room, particular consideration having been given in connection with the design of this receiver to the average size of living room in modern London flats. Operation is very simple, only four

in the majority of larger houses. There are only four controls for vision and one control for sound. This receiver can also be obtained with all-wave push-button radio built in.

Large-screen Receiver

Palace de Luxe Receiver.—The development of this receiver is a striking contribution by the Scophony laboratories to modern requirements in entertainment. The receiver gives a picture approximately 4 ft. by 3 ft. 3 in. It has been designed for that type of town or country mansion which has a large size ballroom or a private cinema theatre so that any number of persons from a few dozen to three hundred can view the picture in comfort. Of course this receiver is also eminently suitable for clubs, schools, churches and any other type of small viewing hall.

The receiver is built into an all-metal cabinet with the electrical gear on a small rack from which the pic-

standard so far adopted by the United States of America. The fundamental principles of the Scophony optical system are employed in this transmitter and result in perfect geometrical definition. This model operates entirely the "tilt and bend" which occurs in the type of film transmitter at present in use.

INVICTA RADIO, LIMITED

St. Andrew's Road, Cambridge. Stand No. 16.

32 gns. Model TL7. Console receiver for vision and accompanying sound; picture on a screen measuring 7½ in. by 6 in.

39 gns. Model TL8 gives a picture measuring 10 in. by 8 in. Two main controls ensure that operation of the instrument is absolutely simple

70 gns. Model TL9 combines an all-wave press-button radio-gramophone with a vision receiver providing a large picture measuring 10 in. by 8 in.

IMPROVING THE TELEVISION CAMERA

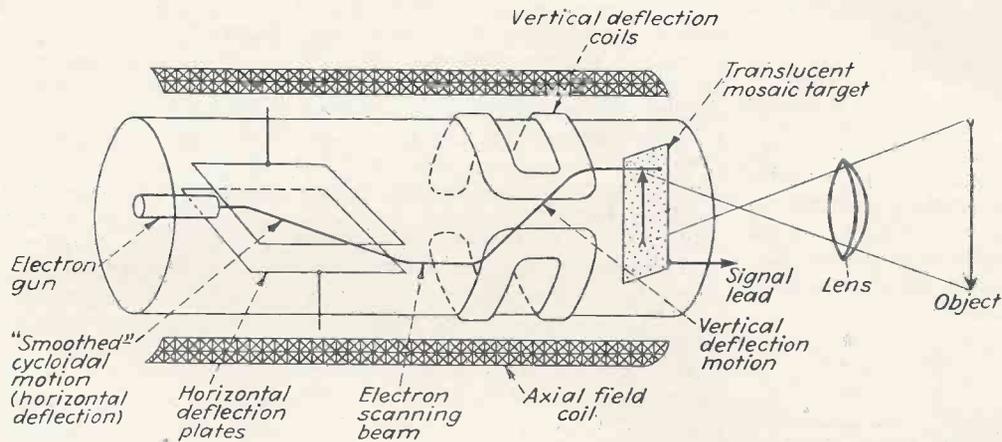


Fig. 3. Schematic diagram of the complete Orthicon. The deflection systems employed are shown in Figs. 4 and 5. It will be observed that the scanning beam impinges on the mosaic at right angles.

THE ORTHICON—A NEW PICK-UP TUBE

THE possibility of increasing the efficiency of the television camera is a matter which is continuously under investigation and, as is well known, notable improvements have been made in the Iconoscope within the past couple of years. Some original developments have recently been made by two engineers of the R.C.A. Manufacturing Co., Research Laboratories, Albert Rose and Harley Iams, which appear to have considerable promise and mark an advance upon the present type of Iconoscope.

In photographic parlance the new tube is a "gamma-unity" device, whereas the gamma of the conventional Iconoscope is in the neighbourhood of 0.7. The new tube it is claimed provides a more contrasty picture from a given subject than can the conventional pick-up tube.

Another advantage is the use of low velocity electrons for scanning the mosaic image plate by which effects of secondary emission from the surface of the plate are made negligibly small. No spurious "dark-spot" signal is generated, and the uneven shading so troublesome in Iconoscope pick-ups is thereby completely eliminated. Finally, the storage efficiency of the new tube is substantially 100 per cent., compared with 5 to 10 per cent. in the Iconoscope. The new tube therefore may be made to have an overall sensitivity 10 to 20 times that of the Iconoscope.

Low-velocity Scanning

The radical difference, between the Orthicon and all preceding forms of

Details of a new pick-up tube were recently revealed at the Convention of The Institute of Radio Engineers, New York. The advantages claimed are that spurious signals are obviated and the storage efficiency is consequently greater than in the case of the Iconoscope. We are indebted to "Electronics," New York, for the details of the paper which was read by the inventors—Albert Rose and Harley Iams of the R.C.A. Research Laboratories.

the Iconoscope, is the use of low-velocity electrons for scanning. This has made necessary the development of a new technique of scanning,

which combines the effects of a magnetic field and an electric field. This new deflection technique is a striking example of the practical application of low-velocity electron optics.

The tube is a cylindrical structure about 20 in. long and 4 in. in diameter. The image plate on which the optical image is focused is located at one end of the tube and measures about 2 in. by 2½ in. The picture resolution obtainable within this area can exceed 400 lines, and up to 700 lines has been achieved.

The relationship between light input and current output is linear from zero light to the value of light which exhausts the beam current (about one microampere). The maximum signal-to-noise ratio is from 300 to 500 times. The sensitivity of the present models is somewhat greater than that of the Iconoscope.

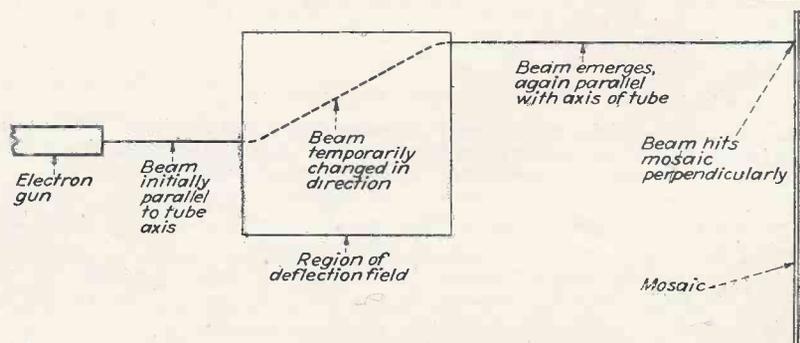


Fig. 1. In order to maintain perpendicular scanning a combination of electronic and magnetic forces is employed, the field deflecting the beam temporarily.

Defects of the Iconoscope

Inconoscope Principles

To appreciate the advantages of the newly-developed tube, it is necessary to recall the operation of the conventional Iconoscope and to realise how the use of a high-velocity scanning beam imposes limitations on the operation of the tube. These limitations were reviewed by Mr. Iams as follows: in the conventional

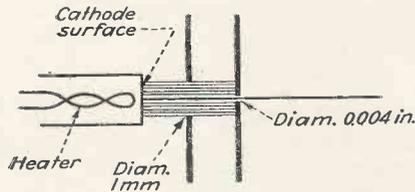


Fig. 2. The simple electric gun employed in the experimental Orthicon.

Iconoscope a mosaic composed of many tiny photosensitive globules is exposed to the optical image. The globules emit electrons under the influence of the light and thereby assume a positive charge in proportion to the amount of light falling on them.

Since the globules are insulated from one another, the charge distribution so acquired cannot redistribute itself, but remains stored on the surface of the mosaic until the

tional Iconoscope is accelerated to a velocity equivalent to about 1,000 volts. The necessity of employing an electron velocity as high as this is the need for maintaining a sharply focused beam which will retain uniform focus over the entire area of the mosaic, and which will excite a high level of signal current.

When the electron beam hits the globules of the mosaic its immediate effect is to liberate secondary electrons from them. The number of secondary electrons liberated depends, among other things, on the positive charge which the mosaic has assumed due to the photoelectric emission. In consequence the secondary electron current from the mosaic varies with the charge distribution induced by the optical image on the mosaic. The variations of this secondary electron current, when collected by the collector electrode of the tube, constitute the signal current from the tube. Hence the secondary emission effect is of primary importance in the operation of the tube.

But, according to Mr. Iams, the secondary emission has other effects which are not desirable, and which in fact limit the operation of the tube. In the first place, there are more secondary electrons liberated than there are electrons received from the scanning beam, since the secondary

mosaic plate in a shower of electrons.

If the shower were perfectly uniform over the whole plate area, the only effect would be a loss of the distribution of stored charge. But the shower is not uniform, due in part to local irregularities in the secondary emission ratio on the plate, and due also to the effect of differences in the field existing at the plate surface. The shower of secondary electrons thus produces a random charge distribution which is superimposed on the regular charge distribution due to the optical image. The random distribution gives rise to a spurious signal, known as "dark-spot," which has no direct connection with the desired picture, and which has the effect of causing an unevenness in the background shading of the reproduced picture.

The presence of the high secondary electron emission has still another undesirable effect. It produces a retarding field at the surface of the mosaic which inhibits the emission of the photoelectric electrons under the influence of the optical image. Therefore the photoelectric current is not saturated, but has a value roughly one-third of saturation. This reduces the possible output of the camera tube by the same factor. The stored charge on the mosaic is, in addition, partially neutralised by the shower of returning secondary electrons, and this effect reduces the net photoelectric effect by another factor of three. The total output of current is thus reduced by two factors of roughly three, and the output signal current is accordingly one-ninth what it would be if the photo-electric emission were saturated and there were no loss of stored charge.

Avoiding Secondary Emission

To improve on the conventional Iconoscope, in the opinion of the authors, the indicated course of action is to get rid of the secondary emission (and thus obtain saturated photo-electric emission, no loss of stored charge and no spurious signal) and at the same time to substitute another agency for the secondary electrons in forming the picture signal.

In the new tube this result is effected by using a scanning beam com-

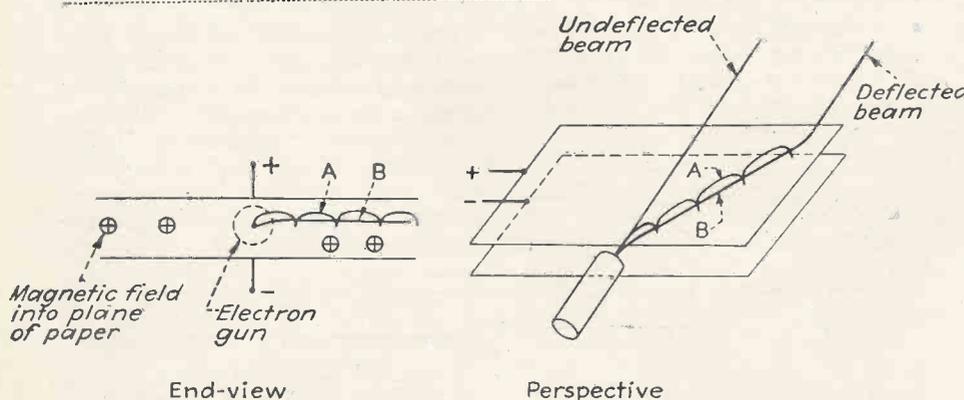


Fig. 4. Method of obtaining "temporary" deflection (horizontal direction). The cycloidal motion (A) is obtained with electric and magnetic fields. The smoother motion (B) is obtained by employing a "fringing field" in the electric component.

charge equilibrium is restored by the scanning beam. This beam, formed in an electron gun in a side-arm of the tube, is directed toward the plate and is deflected by electromagnetic deflecting fields to cover the plate in a pattern of interlaced scanning lines. The beam employed in the conven-

emission ratio is greater than unity. But the mosaic plate is insulated, therefore on the average the number of electrons leaving it must equal the number gained. Accordingly only part of the secondary electron current can be collected; the remainder must fall back on the

A Low-Velocity Beam

posed of low-velocity electrons. The mosaic target is maintained at the potential of the cathode of the electron gun. Consequently the electron beam travels between two electrodes (the cathode and the mosaic) which have no difference of potential between them. Since the electrons start off at a very small velocity at the cathode, they must meet the mosaic with an equally small velocity. The low-velocity beam electrons, when they impinge on the mosaic, are in no position to excite secondary emission, and, in fact, no secondary emission effects have been observed. Furthermore, the low-velocity beam electrons act as the agency for withdrawing the picture signal from the mosaic and conducting it to the collector electrode whence it travels to the external circuit.

The maximum value of the signal current is accordingly equal to the maximum value of beam current, which in the present experimental tubes is about one microampere. Passed through a 100,000-ohm load resistor, this output current is equivalent to a 0.1 volt output signal.

The use of a low-velocity scanning beam is not without its difficulties. In the first place such low-velocity beams are very subject to deflection by stray magnetic or electric fields. In the second place, low-velocity beams are in general subject to severe defocusing if the beam does not hit the scanned surface directly at right angles. Thus, if the scanned beam hits the surface perpendicularly and if the mosaic potential is the same as the cathode potential, the electron comes to rest at the surface, turns around and travels back toward the cathode directly away from the surface. The defocusing which occurs is due only to the emission velocity of electrons from the cathode. On the other hand, if the beam hits the surface at an angle the electrons "skid" along the surface tangentially and are reflected back toward the cathode at an angle equal to their angle of arrival. The point of contact of the electron with the surface is correspondingly ill-defined, that is, defocusing occurs.

To avoid this effect, it is preferable that the scanning beam impinge on the mosaic perpendicularly, no

matter at what point in the scanning pattern. This precludes the use of conventional deflecting technique, in which the scanning beam is caused to scan the surface by the application of deflection forces which change the direction of the beam. In this latter case, the electron beam hits the outer edges of the mosaic at an angle.

To produce a method of scanning in which the beam maintains a perpendicular relation to the mosaic at all points, it is possible to employ a deflecting system which changes the

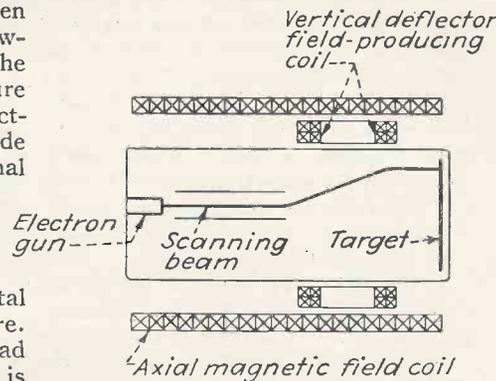


Fig. 5. Vertical deflection is obtained with a transverse magnetic field supplied by coils at right angles to tube axis.

angle of the beam temporarily, as shown in Fig. 1.

The beam enters the deflecting system as a stream of electrons from the gun. The deflecting system imposes a change in direction which persists only so long as the beam is within the deflecting field. Immediately after the beam emerges from the plates, it resumes its forward course and travels from the deflecting plates to the mosaic in a line parallel to the axis of the tube, and finally hits the mosaic perpendicularly. To produce a deflecting system of this type in practice is not simple.

Orthicon Construction

In developing a thermionic cathode type of tube, described by Dr. Rose, the first question was that of the electron gun. A very simple form was used, illustrated in Fig. 2. The cathode is a flat surface, directly in front of which is an aperture approximately 1 mm. in diameter. This aperture defines a bundle of electrons, which is further reduced in

cross-section by a pin-hole aperture ($\frac{1}{100}$ in. diameter). The positive potentials applied to the apertures are of low magnitude, so the beam is composed of low-velocity electrons and the cross-section of the beam is narrow and well defined.

Thereafter the beam travels into the tube proper, shown in Fig. 3. A coil surrounding the tube produces a uniform magnetic field whose lines of force are parallel to the axis of the tube. The low-velocity electrons in the beam, when left to their own devices travel along these lines of force. Deflection is accomplished by superimposing on the magnetic field an electrostatic field between two large deflecting plates. The actions of these deflecting plates is shown in Fig. 4. The deflecting plates impart a transverse motion to the electrons, in the direction of the positive plate. This transverse motion, through the axial magnetic field, causes the electron to describe a path which projected on the end-view resembles a half circle, returning the electron to its original distance from the positive plate. The half-circle motions are repeated and the result, as projected, is a cycloidal motion which displaces the beam to the right as shown.

During this motion, the beam is proceeding forward. Consequently when it emerges from the deflecting plates, the beam has been moved sideways by the width of the cycloidal motion. However, on emerging from the plate, the beam no longer executes the cycloidal motion but takes a path depending on its components of velocity at the instant of leaving the field between the plates. If the electron happens, at this point, to be at the lowest point of one of cycloids, the path after emerging is a straight line parallel to the axis of the tube.

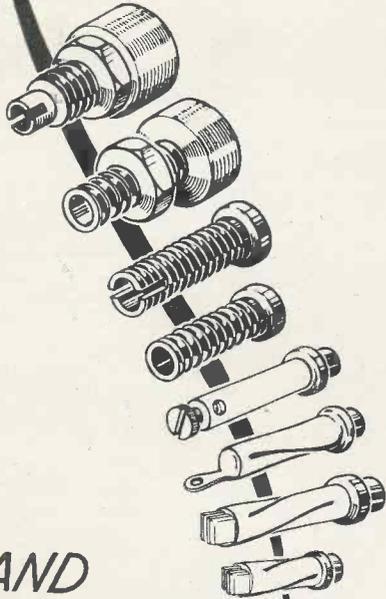
The cycloidal motion is a means of deflecting a beam without introducing any angular deviation between the beginning and end of the electron motion. While the cycloidal motion is a possible mode of operation it is difficult to control. The cycloidal motion may be modified, as shown by the line (B) in Fig. 4, to a motion which moves directly across the tube. This modification of the cycloidal motion is obtained by using deflection plates with appreciable

(Continued on page 573)

SOCKETS

The eight sockets illustrated will give you some idea of the exceptional range of the thirty standard designs available to the Radio Industry, and consistently used by the designers of apparatus described in this journal. There are CLIX Turned Resilient types—CLIX Rolled Resilient types—CLIX Embossed resilient types—CLIX Rigid Tube types and CLIX Insulated Panel Mounting Sockets.

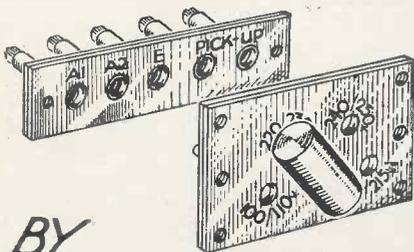
Specifications and illustrations of the complete range are given in CLIX Annual Catalogue, 1939 Edition. You are invited to apply for a copy.



AND STRIPS

The standard stock types of CLIX Chassis Mounting Strips include those having from two to six sockets. These embody the CLIX patent Resilient turned Sockets with screw or soldering terminals and appropriate markings.

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"THE ORTHICON"

(Continued from page 535.)

fringing field at their edges. The electron is thus introduced into the electric field gradually, and the cycloidal motion gives way to a straight-line motion across the tube. By means of curving the edges of the deflecting plates, the necessary fringing field is established, and the smooth deflection motion obtained.

A similar type of deflection could conceivably be used for both directions of scanning (vertical as well as horizontal), but it is more convenient to restrict this type of deflection to the high-speed horizontal motion. The low-speed vertical motion may then be introduced by the use of a transverse magnetic field imposed, as shown by Fig. 5, by a pair of magnetic coils whose axis is at right angles to the tube axis.

The complete tube is shown diagrammatically in Fig. 10. The internal coating of the tube is earthed and the cathode of the electron gun is operated at about 25 volts with respect to earth. The two-sided mosaic target at the other end of the tube assumes cathode potential automatically. The horizontal deflecting plates cause the beam to move along each line of the image, while the vertical deflecting coils cause the vertical frame-scanning motion. The electrons travel to the mosaic, and arrive there with substantially no velocity. If photo-electrons have been lost at that point, due to the influence of the optical image, the beam electron is collected by the mosaic, otherwise it turns around and travels back to a collector electrode near the cathode.

"The R.S.G.B. Exhibition"

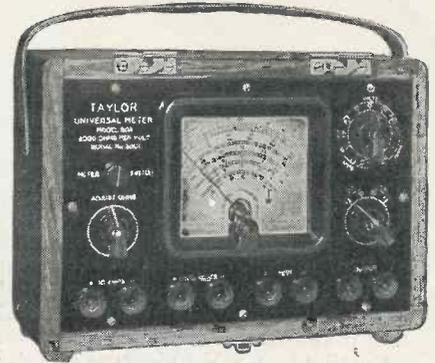
(Continued from page 555.)

- No. 5.—Taylor Electrical Instruments, Ltd.
- No. 5a.—Wingrove and Rogers, Ltd.
- No. 6.—Hamrad Wholesale, Ltd.
- No. 7.—
- No. 8.—N. E. Read.
- No. 9.—General Electric Co., Ltd.
- No. 10.—Voigt Patents, Ltd.
- No. 11.—Dencu.
- No. 12.—Quartz Crystal Co., Ltd.

This exhibition is open to members of the Radio Society of Great Britain only and it is hoped that this year there will be a record attendance.

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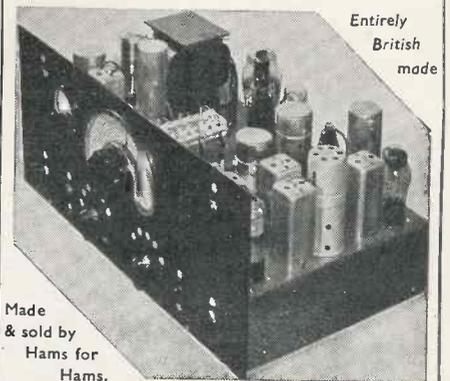
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Scannings and Reflections

TELEVISION AT OLYMPIA

TELEVISION will be well to the fore at the Radiolympia Exhibition, where more than fifty sets will be continuously in action in the Television Avenue throughout the day, taking either the B.B.C. studio programmes from Alexandra Palace, relays from the Radiolympia theatre, or closed circuit relays which will not be radiated to home viewers.

The Radiolympia theatre is a reproduction of the famous "Hollywood Bowl." It is unique in that it is the first theatre ever to be built solely for sound and television broadcasting.

As in 1938, "Come and be Televised" will be a daily morning feature of the Exhibition. Jasmine Bligh and Elizabeth Cowell, the two television announcers, will be "at home" at Radiolympia during the mornings from 11 a.m. to 12 noon to welcome in front of the television cameras members of the public who would like to meet them personally. Visitors will be encouraged to chat informally on any subject which may appeal to them.

During the run of the Exhibition, Harold Cox, the producer, will be available from 2.30 to 5.30 p.m. each afternoon in the B.B.C. reception room.

TELEVISED ENTERTAINMENT

Home viewers and visitors to the Exhibition will be entertained by a whole galaxy of stars. Bobby Howell and his band will play throughout the Exhibition. The Kentucky Minstrels, with Harry S. Pepper and Doris Arnold, will be an almost daily feature, with a banjo accompaniment by Troise and his Mandoliers. Other popular radio and television stars taking part will be the Gordon Radiolympia Girls, C. Denier Warren, Adelaide Hall, Murray and Mooney, Ike Hatch, Scott and Whaley, Nosmo King and Hubert, and C. H. Middleton just to mention a few.

Visitors to the Exhibition will be

able to watch interesting personalities interviewed before the television cameras.

RADIOLYMPIA PROGRAMMES

From the revolving stage of the theatre at this year's big Radiolympia show—the first theatre ever to be built for both radio and television—five programmes, several of them packed with well-known artists, are to be broadcast by the B.B.C.

Arrangements have already been made for the following broadcasts to take place:—

August 23, National: Opening Night—All-Star Variety, with Jessie Matthews and Sonnie Hale; Scott and Whaley; Ike Hatch; Stanford and McNaughton; Adelaide Hall; Nosmo King and Hubert; Charles Austin; the Radiolympia Male Voice Choir; Bobby Howell and his Band; and Troise and his Mandoliers.

August 26, National: Stage version of Harry S. Pepper's "Kentucky Minstrels," with a cast that includes Scott and Whaley; C. Denier Warren; Ike Hatch; Nosmo King; Kentucky Minstrels' Chorus; and Bobby Howell's Orchestra. The guest artist will be Adelaide Hall and the conductor, David Evans.

August 28, Regional: Bobby Howell and his Band.

August 29, Regional: Troise and his Mandoliers, with Emilio, the boy accordionist, Percy Manchester, and Murray and Mooney.

September 1, Regional: Variety Half-Hour, with Nosmo King and Hubert; Adelaide Hall; Murray and Mooney; and the Gordon Radiolympia Girls.

"BITS AND PIECES"

Under this unpretentious title has been worked up what promises to be a most amusing half-hour of light entertainment with a programme which will include Bobbie Kimber in his own ventriloquial act; Robin Hood and Shelagh Furley will contribute songs and dances; Edward

Cooper will entertain with songs at the piano; and Jackie Billings and Diana Chase will be seen in dances.

"Bit and Pieces" will be produced in the evening of August 28 and repeated in the afternoon programme on September 2.

FILMS FOR TELEVISION

A film entitled "Galloping Dynamite" was televised from Alexandra Palace on August 21. Although this was quite a small film and comparatively old, the film trade feel that even this type of film should be withheld from the B.B.C., for television to them is still an important competitor.

TELEVISION AT OLYMPIA

Most of the manufacturers at Olympia this year will be using their own television theatres, some of which will actually be on the stands themselves. One manufacturer claims that 60 viewers at a time will be able to see their new models actually on the radio stand.

CHEAP TICKETS FOR OLYMPIA

The Radio Manufacturers' Association have inaugurated for the first time a special department to obtain low rail and coach fares and generally help dealers. Special party admission tickets are being supplied at 9d. (half their normal price) where a dealer is bringing 20 or more, and in many cases seats are being obtained in Radiolympia's broadcast and television theatre for only 1s. 3d.

GAUMONT-BRITISH AND TELEVISION

It was announced by Mr. Isidore Osterer that television of the big-screen type would be installed in all suitable Odeon cinemas just as fast as the equipment could be obtained. At the annual general meeting Mr. Osterer made the following statement:—

"From the theatre angle we are

MORE SCANNINGS

concerned in what is termed large-screen television and we have taken the necessary steps to secure the installation of these sets in our theatres as fast as they can be produced. Those theatres already equipped have shown many items of great interest during the year, culminating in the wonderful picture of the homecoming of the King and Queen."

GERMAN TELEVISION DELAYED

Owing to the lack of raw material having become so acute it is reported that the Standard television receiver which was exhibited at the Berlin Exhibition will not be available to the public until the end of the year.

TELEVISION FOR THE PROVINCES

On October 9, Mr. Graham White will ask the Postmaster-General for a statement regarding the possibility of a television in provincial centres. It is hoped that the P.M.G. will be able to provide a definite finding.

U.S.A. BAN ON FILMS

Distributors in America are barring the use of films for broadcasting over television channels. This bar comes into operation on August 26, and comes more or less into line with the point of view of the British exhibitors. American television companies are obtaining films at the present time mainly through independent companies, but this scheme has not proved satisfactory.

PUBLIC TELEVISION IN ITALY

Television has at last started in Italy and the first public television performance under the control of the E.R.A.R. was given before an audience of specially invited guests including Italian and foreign journalists.

Public are to be admitted free to the television shows which are to be given each evening at the Circus Maximus. The station situated at Monte Mario has a range of 30 miles and uses 7.40 metres for sound and 6.8 metres for vision.

FIFTY CINEMAS TO HAVE VISION

Captain West of Baird Television, Ltd., mentions that fifty Gaumont-British theatres would be equipped

for vision by the end of next year. He also stated that G.B. have five halls in the London area already equipped and this number will be increased to twelve before the end of 1939.

POLYTECHNIC LECTURES

A course of lectures have been organised by the Regent Street Polytechnic, details of which are as follows. On Monday, September 25, a course in Radio Gramophone Service Work will begin and this is in co-operation with the Gramophone Company, Limited. The second course, starting on September 25, is on Radio and Television Engineering; the enrolment dates are between September 18 and September 22. Full information on these and other radio courses can be obtained from W. H. Date, B.Sc., Polytechnic, 307-11 Regent Street, W.1.

WIRELESS LICENCES

The Post Office issued 363,114 wireless receiving licences during July, 1939. This figure represents a nett increase of 20,640 in the number of licence holders during the month after making allowance for expired licences and renewals.

The approximate total number of licences in force at the end of July, 1939, was 9,030,950 as compared with 8,657,100 at the end of July, 1938, an increase during the year of 373,850.

EDISON EXHIBITS AT RADIOLYMPIA

Mazda cathode-ray tubes, television valves and radio valves are shown on this stand, and a special feature is made of the new Mazda battery valves for dry cell operation. All these valves are fitted with the Mazda octal base.

A novel feature of this year's stand is the "Electroencephalograph," which may be described popularly as a receiving set for tapping in to the brain activity. The apparatus has been designed by Mr. Grey Walter, a physiologist who has spent many years in the special study of the brain. The final form of this instrument is manufactured by The Edison Swan Electric Co., Ltd. A reproduction of a room in a clinic has been set up on the stand and the working of the apparatus is

explained by models, diagrams and labels.

Ediswan are again making a feature of television; the viewing corridor situated at one corner of the stand allowing maximum ease for viewers in passing through. There will be three television screens, and fluorescent displays activated by ultra-violet radiation will form the scheme of decoration. B.T.H. R.K. speakers, headphones, and pick-ups will also be on show.

Modern Test Gear

As the advance in service engineering has been most marked in the past year the Mullard Wireless Service Company, Limited, are specialising in equipment for the advanced service specialist.

Amongst the gear available are the following: A cathode-ray oscilloscope incorporating a three hard-valve time base, a three valve two-stage amplifier, linear up to 1 Mc., and a hard tube. A special oscillograph with a 3 in. high vacuum tube for televising receiver servicing includes a vertical amplifier, with a linear frequency response up to 100 Kc., and again of more than 150 times.

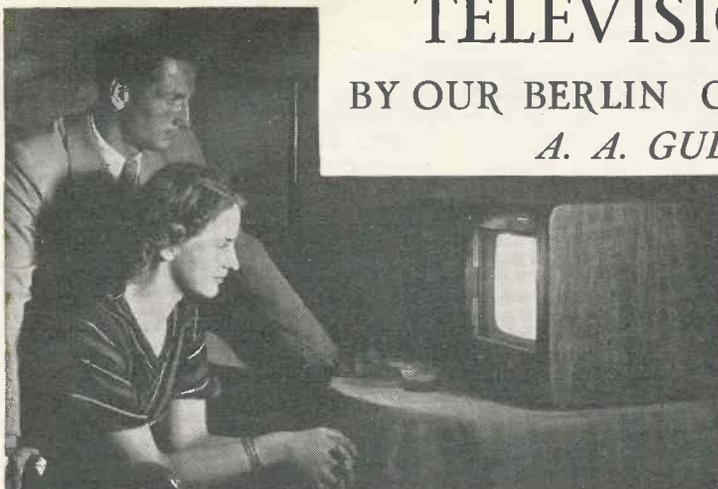
A signal service generator with an R.F. range of 14 to 3,000 metres which uses only four valves and can be modulated or unmodulated as required. Included is a 6-position attenuator and a continuously variable potentiometer. Designed for use with the Signal Service Generator and cathode-ray oscillograph is a frequency modulated oscillator. It incorporates its own supply unit and three valves. The scale for the main frequency control is calibrated in kilocycles (minus 25 Kc. to plus 25 Kc.) so enabling band width to be directly read.

A beat-frequency audio oscillator with a range of 15 to 15,000 cycles is also available and is fitted with two directly calibrated frequency controls. A wide selection of output impedances is available and the maximum output with less than 2 per cent. harmonic content is more than 400 milliwatts.

In addition, radio and television receivers, cathode-ray tubes, receiving and transmitting valves of all kinds are being featured by Mullard this year.

TELEVISION IN GERMANY

BY OUR BERLIN CORRESPONDENT— **1939**
A. A. GULLILAND



Germany's Standard television receiver is priced at 650 marks and the picture size is 19.5 cm. by 22.5 cm. The screen is flat ended and square short tube.

This article is a complete review of the immediate proposals for a television service in Germany. One receiver only will at first be available to the public.

AFTER more than ten years of public experimental services on various numbers of lines for definition, German television has at last become standardised on 441 lines, 50 half-frames per second, interlaced.

The official opening of the first entirely public service was scheduled for October 1st, 1938, but owing to the political situation at the time this was postponed until July 18th, 1939, the opening day of Berlin's sixteenth and incidentally last Radio Exhibition in consecutive series. (Next year there will only be a small show at Cologne in connection with an international exhibition there).

The German Service

Now that Germany, or rather Berlin has a full-fledged television service with regular daily programmes from 5 p.m. to 10 p.m. (from August 6th onwards) and with the possibility of purchasing sets in the shops in the near future, it is interesting to review, very briefly, the present position of German television.

There is one station operating in Berlin in the extreme West-End. The aerial of this station is not sufficiently high and therefore does not give good service in the extreme East End. It has been decided to erect a small 20 watt auxiliary transmitter on a high building in the East End to serve this area.

The two mountain-top transmitters, one in Central Germany on the summit of the Brocken and one near Frankfurt am Main on the summit of the Feldberg, have been completed. They are shortly to start tests. Further television transmitters are already being prepared for Hamburg,

Nuremberg, Munich, Vienna and Cologne.

These transmitters will not be ready until some two to three years' time. Meanwhile there are further plans for Berlin which are already under way and these include the building of a huge "Television Palace" on Spandauer Berg in the extreme West End of the town with a 330 ft. aerial tower. The new building will also contain the most modern television studios. Building is to commence immediately as the present studios are in a house which is to be demolished for the re-modelling of the Adolf Hitler Square into the Mussolini Place in the West End.

People's Receiver

To enable the largest possible number of people in Berlin to take advantage of the television programmes and on the other hand to give the manufacturers some profit without great capital investment, the authorities have prescribed a "standard" television set, which will, at first, be the only one on the

market. This receiver was designed jointly, by pooling experiences and patents, by the five German television firms: Fernseh A.G., Telefunken, Lorenz, Loewe, and TekaDe. The result is a small-sized table model with a picture 19.5 cm. by 22.5 cm. Five thousand of these are to be made by December as a first "service."

The most important improvement compared to former receivers is the introduction of a square tube with a flat face giving a square, flat picture, instead of the usual rounded type with a convex end.

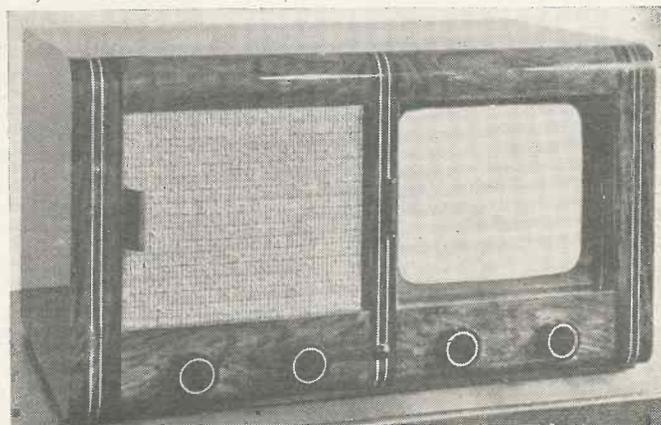
A large number of economies have been effected by various means. Thus the vision receiver has 15 valves of which only four are rectifiers. This has been made possible by the development of two special valves. Then a method has been devised of using the "flash-over" on the transformer for the time-base circuits as anode current, this obviating the necessity for a special H.T. power supply.

These and other economies have made it possible to produce five thousand receivers at the price of £32 10s. od. each at par.

The production of these receivers by December is contingent upon sufficient raw materials being available for their production.

Apart from this standard receiver

The Standard television receiver will be the first to be sold to the public. Its design is the result of a combined effort on the part of the leading German manufacturers.



Square Cathode-ray Tubes

some of the television firms are to continue work on their more expensive receivers which may, at some future time, become available to the public.

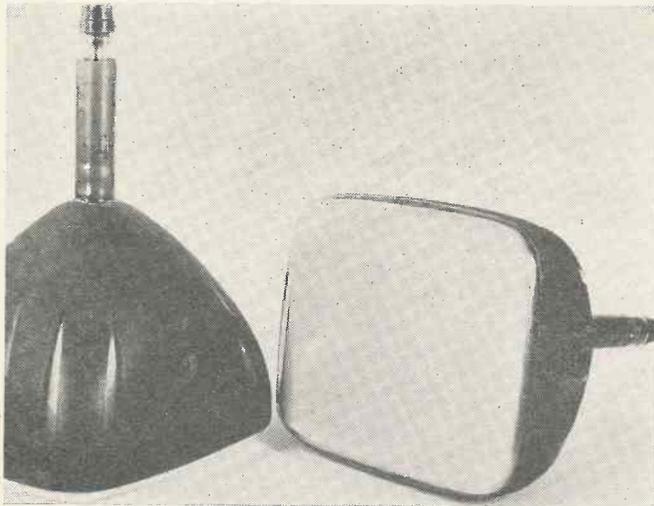
Thus Telefunken is to continue its last year's cabinet receiver, Lorenz its compact table model, and Fernseh A.G. has gone a step forward and has produced three new types of receivers. These were not on general

Fernseh A.G., is 3 m. by 3.6 m. Illumination seemed good and even a little brighter than in some of the smaller 300-seat cinemas. But the television picture lacked the brilliance of the modern cinema screen. This hall will be open regularly to the public from September 1 onwards.

At the Radio Exhibition where the standard television set was shown as the only working instrument in the

screen, but this only worked on two days at the end of the show.

And now a word about the new organisation of the German Public Television Service. The programmes are supplied by the Broadcasting Company Studio equipment, operation, cameras, lighting are by a subsidiary Post Office organisation called The German Post Office Television Co., Ltd., cables and transmitters re-



This is the new square flat-faced tube for Germany's Standard television receiver.



Interior of the Berlin studio with two cameras in operation.

view at the exhibition but were demonstrated only to private visitors in groups. One receiver is a table model with a screen 27.5 cm. by 31.5 cm. This employs one of the new German "short" tubes with a square and flat screen.

Then there is a small table model projection receiver for home use which produces a picture 42 cm. by 50 cm. on a special lens-screen in the lid of the set.

Television service in Germany will be by wireless and also by wire. For the wireless service a standard carrier frequency is used of 8.4 Mc. The wired television service, however, will use a carrier of only 4.2 Mc. Many of the new Fernseh A.-G. have been equipped with this frequency so as to permit of wired television reception.

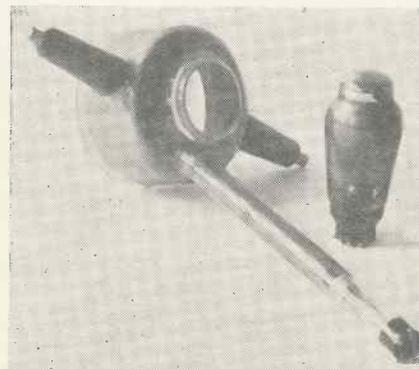
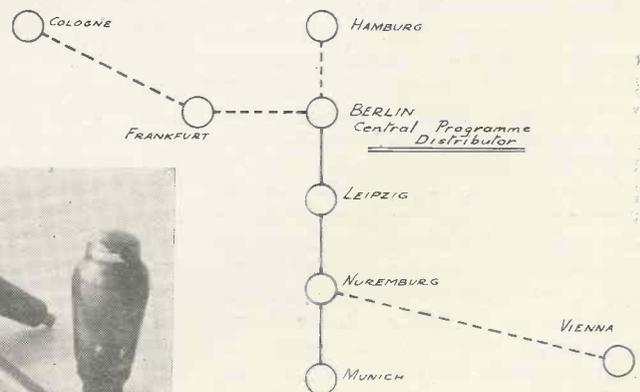
As far as large-screen projection reception in Germany is concerned there was a very successful demonstration during the show in a Post Office in the North End of Berlin. This was in a hall three floors up and which has no lift. It will hold some 500-600 people. The screen, which is the new lens-type developed by

television section, a tent had been installed for a large-screen projector by Professor Karolus. Some trouble was experienced with this, however, and it was never demonstrated. On the other hand Telefunken installed a projection tube receiver for a small

main in the hands of the Post Office, as in the case of the broadcasting transmitters.

The formation of a Post Office company for the technical studio was due to the fact that this is the usual custom with the German Post Office

Full lines show television cables already in existence and dotted lines those proposed



These are two of the small projector tubes used for the Fernseh home projector. An ordinary valve gives an idea of the size.

when it is wished to run an undertaking on semi-commercial lines.

The system of public televiewing rooms is to continue; there are ten of them in Berlin and one in Potsdam and all are equipped with 441-line receivers.

A NEW BAIRD COLOUR-TELEVISION SYSTEM

By F. W. Marchant

First technical details of an experimental colour television system employing a cathode-ray tube at the receiver

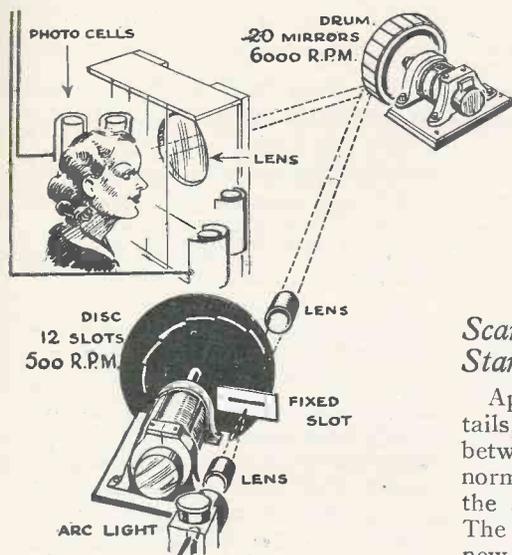


Fig. 1. The Baird colour television transmitter.

AS was briefly reported in last month's issue, towards the end of July, Mr. J. L. Baird demonstrated a very considerable advance in the technique of television in natural colours. Prior to this demonstration, Mr. Baird has employed apparatus which was wholly mechanical, both at the scanner and at the receiver, the last instance of this being when he gave a series of demonstrations at the Dominion Theatre, Tottenham Court Road. On that occasion rather cumbersome and expensive mechanical apparatus was employed, details of which appeared in this journal. The recent demonstration, although employing a transmitter similar in type and operation to the one used at the Dominion Theatre, made use of the cathode-ray tube as the receiver: a very great step forward.

It must be appreciated that it is permissible to use a mechanical scanner for the transmitter since at the transmitting end there are skilled technicians capable of operating the apparatus. At the receiver, however, it is a very different matter. While it is quite possible to have duplicate sets of an electronic apparatus, it is not an economical proposition, either with regard to finance or space, to duplicate a complicated mechanical scanner, from the point of view of the cinema, for which this apparatus is of very considerable interest. For this reason, and also since the system will perhaps eventually be suitable for normal television receivers, this demonstration of the use of the cathode-ray tube in colour television is of importance.

Scanning Standard

Apart from actual mechanical details, the fundamental difference between the colour system and the normal television system, is that of the standard of scanning employed. The scanning sequence is far from new, in fact Mr. Baird used it in some of his very early experiments in 1923. A description of the type of scanning now employed was given in this journal in January, 1937, but perhaps it would be as well to give here a brief description of the system, known as the "Baird Multi-mesh Scanning System."

Secondary Scans

The "raster" in this case is not covered by just two separate scans interlaced, but by a number of "secondary" scans, each composed of two interlaced scans, interpolated. This is achieved by producing the secondary scan in the manner mentioned, and then laterally displacing it a number of times. For instance, a final scan of 240 lines may be formed by a secondary scan composed of two 30-line scans interlaced, which is then displaced four times, so forming a final "raster" of (2 by 30) by 4 which equals 240 lines, multi-mesh scanning.

It is claimed for this system that it has a number of advantages over

the normal type of scanning. These are as follows: (1) a high frame frequency with an accompanying high-low-frequency cut off is obtained; (2) a reduction in flicker and a considerably increased light efficiency; (3) an exceedingly simple optical system of very high efficiency may be employed.

Will Receiver Sales be Influenced?

The manner in which the announcement of colour television would influence the sale of normal television receivers, was the cause of some misgiving in official sales services of the industry. It was felt that potential purchasers of receivers would consider waiting until it was possible to buy a set which would give coloured pictures. This is, of course, entirely the wrong attitude to take, but nevertheless there is little doubt that some people would think along these lines. The above description of the scanning system shows clearly that great alterations in the transmitting gear would be necessary before it would be possible to give the public a service of coloured television, and also it must not be forgotten that the B.B.C. has undertaken to make no changes which would make a change in receivers necessary, until after 1942 at the earliest.

The demonstration must be re-

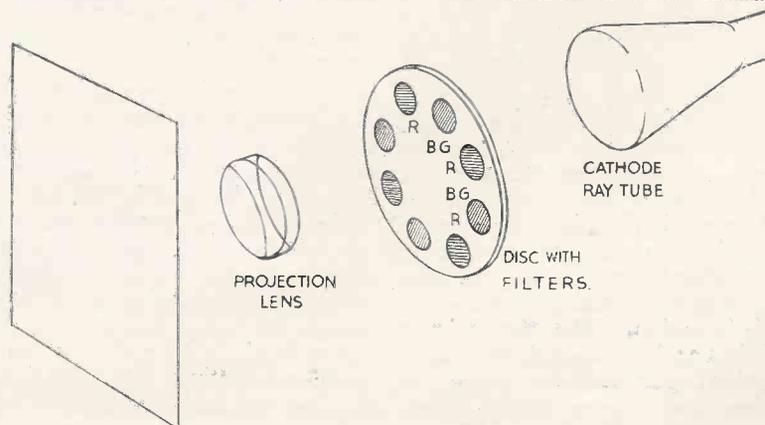


Fig. 2. Schematic outline of Baird colour television receiver.

garded as purely experimental and as showing how, in the near future, the system might be of great interest to the cinema, rather than to the ordinary television viewer. This does not necessarily mean that in the distant future colour television will not be available to the general public, but rather that the probabilities are that the cinema will be able to make use of it far earlier than the B.B.C., because cinemas could have their own transmitting station, and therefore not be dependent upon the normal transmissions.

Details of Apparatus

It is a well-known fact that all colours may be obtained by a mixture of the three primary colours, red, blue and green. J. L. Baird makes use of alternate red and blue-green filters in his apparatus, with which he obtains the suitable colour tones.

The method of scanning employed at the transmitter consists of the spot-light system. That is to say, the subject being televised, is scanned by a spot of light moving in the correct scanning sequence.

Fig. 1 shows clearly the manner in which the scanning apparatus operates. The light source is a high-intensity arc lamp, the rays of which are projected through a stationary slit, behind which revolves a scanning disc. This disc has arranged around its axis, a series of slots, in helical formation toward the centre of the disc. It will be clear that as the disc revolves, the slots passing in turn behind the slit, will in fact form a scanning spot which moves along the slit. The resulting spot of light is then projected upon a mirror drum, which in turn reflects it on to the subject being televised. The light reflected from the subject is then picked up by special colour sensitive photo-electric cells, the resulting electrical impulses being passed through the amplifiers to the radio transmitter.

Each slot in the scanning disc is covered with a colour filter, the first slot red, the next blue-green and so forth, so that in effect, the subject is being scanned with alternate spots of red and blue-green light, so that the special cells transmit a red and blue-green image depending upon which filter is in action. The mirror drum, which has 34 facets, revolves at 6,000 revolutions per minute, while the scanning disc revolves at 500 revolutions per minute. This combination

gives a final "raster" of 102 lines, at a monochrome frequency of $33\frac{1}{3}$ per second, being composed of a secondary scan, made up from three scans of 34 lines interlaced the secondary being displaced three times. This results in a 102 line red picture, superimposed on a 102 line blue-green

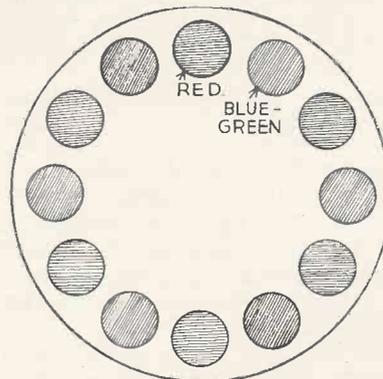


Fig. 3. Diagram of colour filter disc.

picture, the final result being a 102 line picture in natural colours at a colour picture frequency of $16\frac{2}{3}$.

It will be noted that the transmission end is similar to that used at the Dominion Theatre, but that instead of subjecting the televised person to

the rays of an exceedingly brilliant light, the spot-light system is used.

The Cathode-ray Tube as the Receiver

The application of the cathode-ray tube at the receiving end, although being the outstanding advance in this system, is quite simple. A glance at Fig. 2 will show quite clearly the manner in which the coloured pictures are obtained. The incoming picture signal is used to modulate a cathode-ray tube in the usual manner so giving a normal black and white picture on the tube. In front of the tube, there is rotated in synchronism with the scanning disc at the transmitter, another disc with colour filters arranged in the same order, Fig. 3. The picture on the tube is projected through these filters on to a screen, and since the transmitted signal represents alternately the red and the blue-green component of the subject, then in the same order a red and blue-green picture will be produced.

In the demonstration the picture shown was some 3 feet square, and was transmitted from the South Tower of the Crystal Palace to Mr. Baird's home in Sydenham.

150,000 R.P.M.

High-speed Motor-scanner Development

FOLLOWING experiments in television reception with the steel-ball scanner unit recently developed for the mechanical receiver described in this Journal, Mr. Jeffree is making slight modifications in the design to facilitate synchronising. These will have the effect of making this less dependent on the circuit used for driving the unit. The general appearance will not be much altered, but the efficiency in terms of torque developed for a given input will at the same time be improved.

At the same time a small motor of similar type, without the ball scanner, is being produced for experimental purposes, with a view particularly to its use in school laboratories. One characteristic of this type of motor is, that it can be synchronously run at a wide range of speeds, either under the control of an external frequency or at the speed determined by the uncontrolled oscillator setting. It can therefore be used for exact counting of oscillations and for driving light apparatus

at precisely controlled speeds, on the principle of the well-known electric clock, and also for experiments demanding very high speeds of rotation, such as the determination, even over path distance of a few yards, of the velocity of light. To facilitate its use for such purposes, a number of simple attachments will be made available, including a train of gears giving reductions of 10, 100, 1,000 and 10,000 to one, for recording the number of rotations in a given period; mirror attachment and auxiliary apparatus for measuring the speed of light.

A "really" high speed motor is also being worked on, designed to run at about 150,000 r.p.m. from a frequency of about 10,000 cps. This will be self-starting and synchronous only at the full running speed.

The two former types, for the mechanical receiver and for schools, will be obtainable, as hitherto, from H. E. Sanders and Co., of Grays Inn Road; the schools type, it is hoped, within a week or two.

A RECORD OF PATENTS AND PROGRESS

RECENT TELEVISION DEVELOPMENTS

PATENTEES

Radio Akt., D. S. Loewe
E. L. C. White and C. L. Faudell
Scophony Ltd., G. Wikkenhauser
and A. F. H. Thompson
J. D. McGee
Scophony Ltd., and F. Okolicsanyi
Fernseh Akt.

Interlaced Scanning

(Patent No. 504,460.)

IN interlaced scanning it is essential to ensure that the second series of lines fall exactly between the first set, because the eye is so sensitive that it will perceive the fault even if the displacement is only of the order of 1 per cent. The trouble usually

sible burn-out, should the scanning voltage fail for any reason and so allow the scanning spot either to come to rest on the screen, or to traverse the same scanning line several times in succession.

The line and frame scanning currents are fed to the deflecting coils of the C.R. tube from two separate amplifiers. Each amplifier is coupled

ply. Simultaneously a discharge path is provided to the comparatively-low voltage of the mains supply line. This renders the scanning beam harmless.—E. L. C. White and C. L. Faudell.

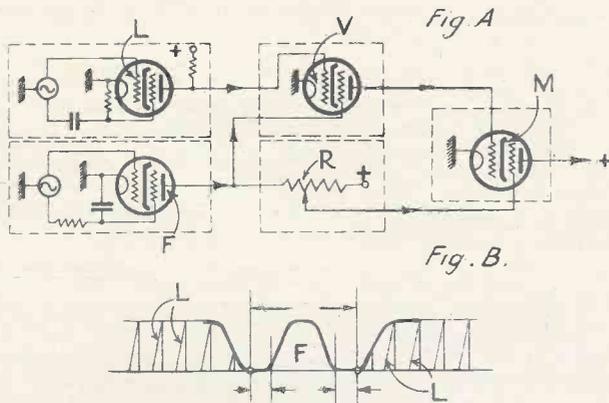
Scanning Systems

(Patent No. 504,668.)

The Figure shows in schematic form the arrangement of a two-sided mosaic-cell screen S, which is actually mounted inside a cathode-ray tube. The picture to be televised is projected through a lens L on to the front side of the screen, which is also subjected to the action of a scanning-stream of electrons from the gun G of the cathode-ray tube. The result of this scanning is to release electrons from the screen S on to a positively-charged anode A made in the form of a ring.

The other face of the screen is scanned by a strong ray of light projected from a rotating mirror-drum M and disc D. As a result electrons are liberated from the screen S on to a second ring-anode A₁, which is kept at a fixed positive potential.

The two scanning operations follow each other rapidly, but during the interval between their repetition (i.e. for practically the whole of one framing period) the mosaic cells are building-up a charge corresponding to each elementary "point" of the original picture. The sudden changes of potential produced during the



Method of ensuring accurate interlacing.

Patent No. 504,460.

arises when the framing impulses are not completely separated from the line impulses.

According to the invention, the problem is met by suppressing the line impulses for a short period immediately before the arrival of each framing impulse. In Fig. A the generator for the line impulses is shown at L, and that for the frame impulses at F. A valve V, which is connected between the line generator L and the mixer valve M feeding the transmitter is controlled by the frame-impulse voltages across the resistance R, so that it ceases to conduct just before and just after each framing signal. The result is shown in Fig. B, where the train L of line impulses is "cut out" on each side of the framing signal F.—Radio Akt., D. S. Loewe.

to a shunt rectifier, so as to develop a grid voltage for an auxiliary or control valve.

If the supply from either of the scanning circuits is interrupted for any reason, the voltage on the grid of the control valve cuts down the output current from that valve, and so automatically opens a relay in one of the leads to the high-tension sup-

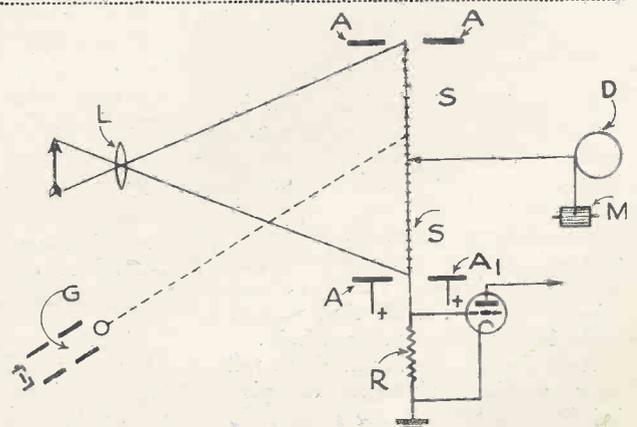
Protecting the Fluorescent Screen

(Patent No. 505,490.)

The sensitive screen of a cathode-ray tube is safeguarded against pos-

Combined electronic and mechanical scanning system.

Patent No. 504,688.



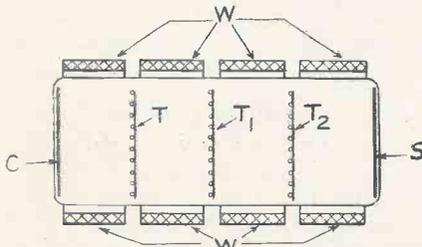
The information and illustrations on this page are given with permission of the Controller of H.M. Stationery Office.

scanning operations develop picture signals across the resistance R.—*Scophony, Ltd.*; *G. Wikkenhauser*; and *A. F. H. Thompson*.

Electron-Multipliers

(Patent No. 504,927.)

A picture is projected on to a photo-sensitive cathode C, and the electrons emitted from the latter are focused by external windings W and passed in succession through a



Electron-multiplier with permeable screen.
Patent No. 504,927.

series of secondary-emitting electrodes T, T₁, T₂. They finally reach a luminescent screen S, where the picture is reproduced at higher intensity owing to the successive amplification produced at each of the electrodes T.

The electrodes T are made of a very thin film of metal, a few millionths of a centimetre thick, laid over a fine-mesh wire grid. The metal is so thin that when electrons strike against one side of it, secondary electrons are projected from the other side. In effect each electrode is permeable to the stream, which can therefore pass from one end of the tube to the other.

The luminescent screen S is replaced by a "mosaic cell" screen when the arrangement is used for developing television signals for transmission.—*J. D. McGee*.

Television Systems

(Patent No. 505,653.)

The object of the invention is to make a more complete use of the variable factors present in the signals now used in television. In practice the amplitude of a given signal determines the brightness of a particular point on the picture, whilst the phase of the signal determines the position of that particular point in the picture as a whole.

Actually the eye is unable to follow very gradual changes of picture brightness, though the amplitude of the transmitted signal keeps pace

with every alteration, no matter how small it may be.

It is therefore proposed to use the amplitude-variation of a single signal impulse to transmit information of the changes in brightness of several picture-points, simultaneously. In this way better use is made of each signal wave, so that the frequency-band normally required to transmit pictures of a given quality can be reduced. Alternatively the same spread of frequency-band can be made to transmit more complete "information" such for instance as would enable the picture to be reproduced in colour.—*Scophony, Ltd.*, and *F. Okolicsanyi*.

Optical Projectors

(Patent No. 505,850.)

The ordinary lens system used for projecting a picture from the fluorescent screen of a cathode-ray receiver on to an external viewing-screen is replaced by a "mosaic" lens, built up of a large number of small pieces of glass. The glass particles, which may be hemispherical in shape, are mounted on the back of the fluorescent screen by means of a transparent adhesive having a low refractive index.

Each individual lens should be of approximately the same size as the scanning-spot. It serves to collect the light from each elementary picture-point into a parallel beam, which is then easily projected on to the external viewing screen.

This avoids the loss of light which usually occurs, owing to the rays of light from the screen being dispersed in all directions. In such circumstances only a small proportion is collected even by a lens of large aperture.—*Fernseh Akt*.

Summary of Other Television Patents

(Patent No. 491,934.)

Producing saw-toothed scanning-impulses from a valve of the relaxation-oscillation type.—*C. L. Faudell* and *E. L. C. White*.

(Patent No. 504,109.)

Cathode-ray television receiver using secondary emission to increase the brilliancy of the received picture.—*O. Klemperer*.

(Patent No. 504,526.)

Cathode-ray transmitter in which an electron image is first analysed into elementary components which are then amplified before transmission.—*Farnsworth Television Inc.*

(Patent No. 504,725.)

Preventing distortion due to feedback "ripple" in a saw-toothed oscillation-generator.—*The British Thomson-Houston Co., Ltd.*, and *D. J. Mynall*.

(Patent No. 504,898.)

Rotary scanning system for televising from cinema films combined with a lens unit for producing synchronising impulses.—*Electrical Research Products Inc.*

(Patent No. 505,022.)

"Blocking" oscillator for generating saw-toothed impulses for use in television.—*C. L. Faudell*.

(Patent No. 505,031.)

Preventing picture distortion produced by inaccurately tuning the sound circuits in a television receiver.—*Telefunken Ges fur drahtlose Telegraphie M.B.H.*

(Patent No. 505,197.)

Compensating for variations in the brightness of the scanning spot due to local variations in the thickness of the luminescent screen.—*Baird Television, Ltd.*; *G. Dovaston*, and *G. E. G. Graham*.

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T elegossip

MR. HAROLD COX, the producer of the feature "Come and Be Televised" at Radiolympia, tells me that he is faced this year with a problem precisely opposite to that which troubled him last August. At the last show members of the public were so shy of facing the cameras that for two or three days he was at his wits' end to find people who wanted to be televised.

After a harassing first day he was reduced to ringing up friends on the telephone and imploring them to help him out. Later on things improved.

This year the B.B.C. issued an early invitation to the public to send written applications to Alexandra Palace. The result was that at the time of writing Mr. Cox was wading through the best part of a thousand letters. One reason for the deluge appears to be that most of the writers were under the mistaken impression that the B.B.C. intended to pay them. Actually, the B.B.C. proposes to do nothing of the sort and in fact will not even pay expenses.

Amateur sopranos and raconteurs were in the majority among the applicants. Some had taken part in the Spanish civil war, but there were people with every sort of experience from big game hunting to service in the Foreign Legion. Six hairdressers wrote (all independently) offering to demonstrate how they had cut the hair of various famous people. Some fifty mothers told the B.B.C. they had offspring who were second Shirley Temples. One lady of seventy-five offered to give a display of physical culture. There were innumerable professionals, chiefly instrumentalists and acrobats, for whom the invitation was not strictly intended.

The setting for "Come and Be Televised" will be a drawing room, in which Jasmine Bligh will preside over the morning coffee-pot, and talk informally to her visitors. Each item will be a friendly chat more than an interview, and there will be no page-boy to introduce the arrivals, as last year.

Receiver Prices

Visitors to the exhibition will by now be aware that there are no reductions in receiver prices and in some cases there are actually small

By L. Marsland-Gander

increases. The manufacturers have made a big effort this year to put the market on a rational basis and have divided the sets into four classes with minimum price levels in each class. This is not a "ring" to force up prices but a sensible arrangement to turn losses into a small profit.

Low thunder clouds, some people are finding, are capable of causing ghost images.

I heard the other day that a set was installed on one of the training ships on the river, and the engineers were horrified to find that they had three distinct images instead of one. The trouble was only overcome when they erected a sharply directional aerial of the "tilted wire" type.

Incidentally the trade, while pressing hard for that Birmingham station, has not paid half enough attention to the problem of interference in general. If it were made compulsory to fit suppressors to the sparking plugs of motor cars, enormous handicap to television development in districts outside the service area would be removed. The potential audience would be doubled or trebled at a stroke.

Long-Distance Reception

I have recently watched programmes on sets in the neighbourhood of Littlehampton and Worthing, roughly sixty miles from Alexandra Palace. The snowstorm on the picture is bearable but car interference is particularly troublesome on the sound and does a lot to spoil enjoyment. Such interference is the more irritating when one reflects that it is really quite unnecessary. But the fact is that the car manufacturers have not had their consciences roused in the matter.

I took my car into the service depot of one of the leading manufacturers the other day and when I called to collect it was astonished to find that all the suppressors had been removed. When I asked the reason I was told "Oh, we always do that."

If the Television Committee of the R.M.A. would divert a tenth of the energy they have given to procuring provincial television to urging upon

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the Postmaster-General the need for legislation on car interference, they would do viewers and the industry a great service. The last word of the Postmaster-General on the subject of the anti-interference clauses in the new Wireless Telegraphy Bill was that the long delay was being caused by the necessity for consulting so many different interests.

The picture as received at Littlehampton is excellent, apart from the superimposed noises and blemishes. There is no difficulty whatever in holding it, although the Downs just behind make a 500-foot barrier between the town and Alexandra Palace.

The News Reels

I hear that negotiations are going on between Mr. Gerald Cock, Sir Stephen Tallents and the cinema industry over the supply of news reels. The B.B.C. is desperately anxious to prevent the application of the threatened ban, and the prospects, at the moment, that they will succeed are quite hopeful.

This activity is, of course, purely defensive. I have not discovered any plans for an ambitious autumn programme "putsch." The disappointing fact is that for the past nine months there has been no development worthy the name at Alexandra Palace except staff increases to a total of 500. No progress whatever has been made with the scheme to convert the old theatre into a big new studio. The B.B.C. is still waiting for that Treasury grant. And we have been told *ad nauseam* that the B.B.C. cannot increase hours or launch out in other directions till cash is forthcoming to provide more studios.

Still, television troubles are not all financial. I understand that 80 per cent. of the potential variety artists in the country are now banned by their managements from appearing in television. The B.B.C. puts this forward as an excuse for the employment of so many foreign artists and it is certainly difficult to find the answer. However, the ban indicates that some of the people who are in the best position to judge entertainment value think that television is now so good as to be a very serious competitor.