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EDITOR F. J. CAMM

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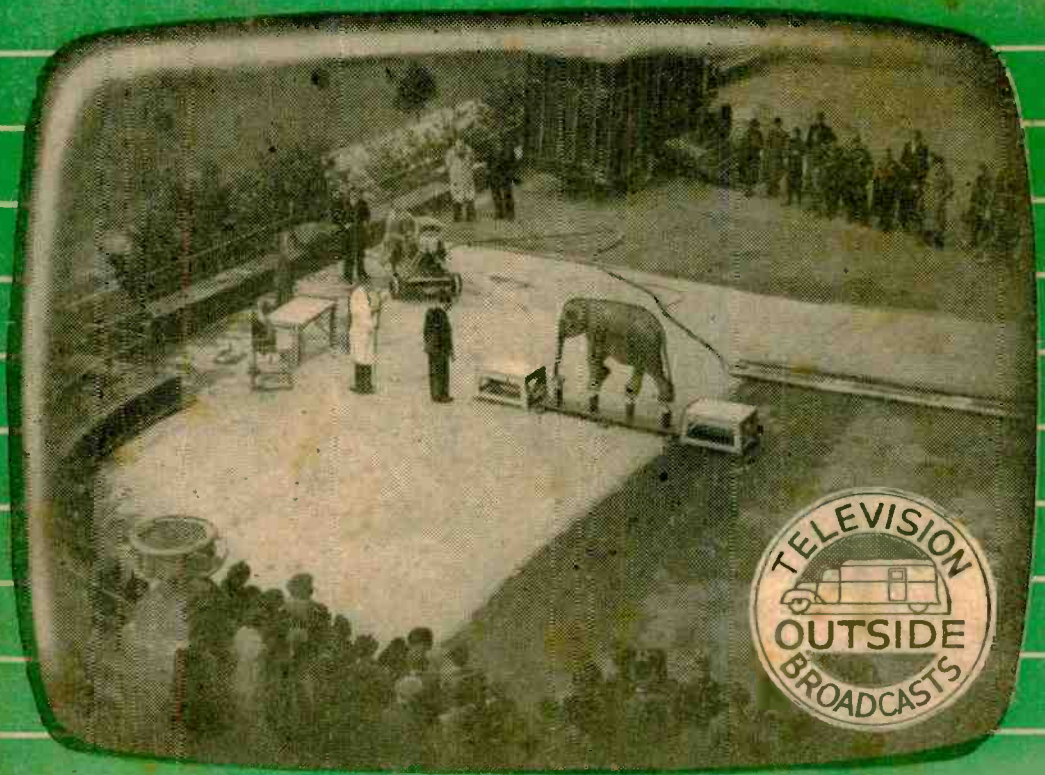

IN THIS ISSUE

PRACTICAL TELEVISION

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Televiews

Wanted—An Experimental Programme

THE B.B.C. estimate that only about 4,000 people in this country are experimenting with television receivers has been proved, by the great success of this journal, to be very wide of the mark. This journal, the demand for which, in spite of a 100 per cent. increase in the printing order for No. 2, remains unsatisfied because of paper and production difficulties, is read by over 1 in 3 of the total number of viewers, which at the moment of going to press is in excess of 350,000. The demand is fairly evenly spread throughout the country, which indicates that many who cannot as yet enjoy the pleasure of looking in and experimenting with viewing apparatus are preparing themselves for the time, in the not too distant future, when television will be available to them. We estimate, with reasonable accuracy, that over 50,000 people in this country with technical qualifications are experimenting with television from a scientific point of view, and the number increases week by week. The B.B.C. could make great use of their unpaid services by putting out, once a week, perhaps every Sunday morning, a purely experimental programme for these experimenters, inviting them to send in reports in an approved form for the guidance of the B.B.C. technicians. Such a programme would be of enormous benefit to the B.B.C. and enable them to improve their transmissions. Every experimenter's home would thus be converted into a B.B.C. looking-in post. The genuine experimenter is not so much interested in looking in as in finding out. It is in the technical aspects that he finds pleasure, and the B.B.C. could make great use of his services. It would help them to locate difficult reception areas, to improve reception in the fringe areas, enable them to plot a fairly accurate chart of the dissipation of signal strength, and of the directional properties of their transmissions; it might even result in extending the present reception radius of 50 miles. We hope the B.B.C., who have been so co-operative, will consider our suggestion, and put out a weekly experimental programme.

"COPYRIGHT" IN SPORT?

THE B.B.C. is experiencing difficulties in connection with television transmissions, analogous to those which beset them in the early days of 2LO. Then the gramophone companies thought that the radiating of gramophone-record programmes would destroy the sale of gramophone records. Actors and actresses were forbidden to broadcast because theatre managements thought that radio would abolish the theatre-going habit. The newspapers were averse to publishing B.B.C. programmes because they thought that this new national habit would somehow affect their sales. In every case these fears proved groundless. As a fact radio was directly responsible for the present enormously increased demand for records; and it has encouraged and extended the theatre-going habit.

Those responsible for organising national sports meetings such as football and race meetings have formed themselves into an Association for the Protection of Copyright in Sport, and its object is to persuade sports promoters to refuse to co-operate with the B.B.C. unless they are assured of what they consider fair terms for the rights to have their events televised. This problem has been smouldering since 1939 when the fight between Eric Boon and Arthur Danahar was televised at Harringay. It was the first boxing match to be shown on a large television screen in a cinema to which the public had paid for admission, and the owner of the cinema paid the promoter of the fight a percentage of the takings. The plans to develop this were rendered moribund by the war, but it can be stated that the sports promoters saw that television would provide them with an audience of several hundred thousands instead of the few thousands which could attend in person. On the other hand the B.B.C. saw that it would be an intermediary supplying programmes from a sports promoter to the cinema cash-paying public.

Perhaps someone will investigate the legal position and establish whether the term copyright can be applied to a horse race, a boat race, or a boxing match. In our view it cannot. Sports promoters naturally fear that a viewer may prefer to watch one of these sporting events in the comfort of his own home and at the same time save the admission fee, but past history shows that this does not, as a fact, take place. On the other hand, such television broadcasts bring the pleasures of viewing such events into the homes of tens of thousands of people who otherwise would not be able to witness them. It will be a serious blow to television if the banning of such O.B.s takes place.—F. J. C.

Scenery for Television

Details of an Important Part of Television Production

By PETER BAX, Head of Television Design

A YOUNG man came to see me recently. He wanted, he said, to be a scene designer for television. He had only seen television once—tennis from Wimbledon—and he had brought some specimens of his work to show me. A portfolio was laid on my desk and out of it came about a dozen water colours painstakingly copied from picture postcards. He was followed a few days later by another aspirant, a girl this time, who brought some brightly coloured diagrams wrought from her own inner consciousness. Now, it is abhorrent to me to discourage anyone who shows the least artistic enthusiasm, but I had, as gently as possible, to tell my visitors that a television designer was a highly-trained technician who had to be familiar, among other things, with the protractor and the laws of light. He had to deal with weights and the strength of materials and he had to be able to tell carpenters, metalworkers, papier mâché workers and others exactly what he wanted. I showed my visitors the plans and elevations made by our designers and told them that, if that sort of thing appealed to them, and they cared to become proficient in it, I would be pleased to see them again. Somehow I don't think I shall ever see them again. It was such an obvious shock to them to discover that "art" is not the be-all and end-all of scene design.

Actually scene design is a composite affair and in order to understand it we'd better find a definition. What is scenery as understood in the theatre, the film studio and in television? It is made up of two things, sometimes more of one, sometimes more of the other and sometimes both in fairly equal proportions. The first component is, of course, aesthetic. The designer must provide a background for the performer and this background must be in harmony with what the performer does and how he looks. It is therefore linked with the mood and period he is trying to evoke. These may be surprisingly various. It is not too much to say that the scenic designer must be ready to change his scenes to any place at any time and, in addition, be ready to do this in any one of a hundred moods. Thus he may be asked to design the Tower of London for "Richard III" and later to design it again for "The Yeomen of the Guard." Not only must he be ready to provide the exact part of the Tower called for by the show, but he must find out how it looked in the XVth century for Richard and the XVIth century for the Yeomen. Again he must take into account that the mood of the first play is quite different from that of the second and alter his design accordingly. Again he may be asked to draw up a background which has none of the grim beauty of the Tower of London to help him but which, at first sight, is sordid and all but featureless. Here all his resources will be taxed to make the scene add something to the performance. No designer, worthy of the name, will just provide any old brick wall when the script simply calls for a "brick wall." There can be jolly brick walls, gloomy brick walls, old, new, clean, dirty, dull and amusing brick walls. A brick wall in the evening sunlight at Hampton Court is quite

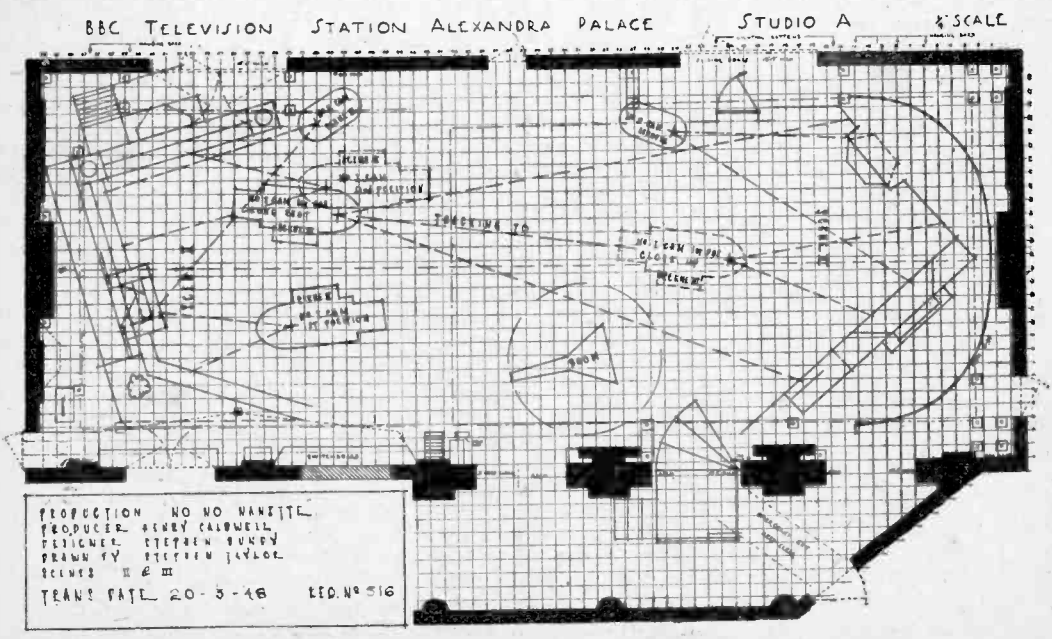


Fig. 1.—Studio layout which indicates scenic settings, camera positions, etc.

a different thing from the one enclosing an industrial town's gasworks as seen on a wet night by the light of a street lamp.

All this may seem a little obvious perhaps, but what seldom seems to be obvious to the layman is the work that all this entails. First of all the designer must know exactly what the intentions of the producer are. If a play is concerned he, as well as the producer, must read the script and then, as likely as not, help the producer to prepare a working script which is by no means always the same book of words that left the playwright's desk.

Well, that's something about the first, the aesthetic component of scene design. The other one is practicability. This, of course, has nothing to do with art. It is sheer carpentry, engineering, mixed up with a dozen different trades and seasoned with a strong dash of finance.

Scenic Build-up

Some scenes call for very little artistic content. The background for a gentleman who is lecturing about economics must be as uncompromising and severe as economics usually are. But the gentleman may want all sorts of things to illustrate his points—easels, a desk, a chair, a blackboard and, almost certainly, diagrams. This is an extreme case, of course, and one which leaves the designer very little to do in an artistic sense. There are other scenes however which combine both sides. Imagine that the producer requires a scene in which a girl dashes up to a front door, unlocks it and goes in. She is then seen inside the hall and racing upstairs—across the landing and into a room—just in time to prevent another girl from throwing herself out of the window. The aes-

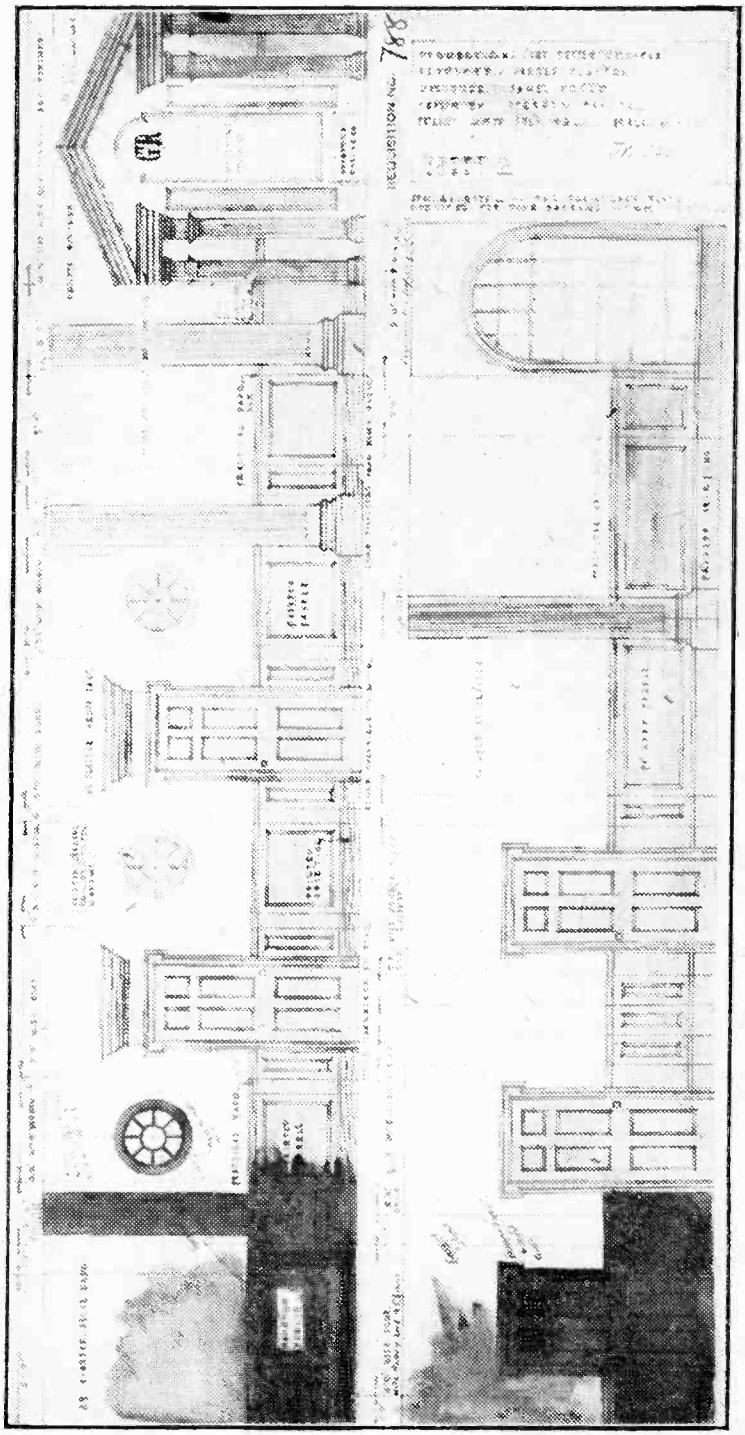


Fig. 2.—Reproduction of an actual sheet of elevations as supplied by the designer to the workshops.

thetic side of the designer asks such questions as "Where is this taking place, in London, Paris or New York?" "What sort of house is it, rich, poor, luxurious or just plain neutral?" "Why is the girl going to throw herself out of the window—is this play a tragedy or does it all end happily?" Those are only samples, of course, there are plenty of other things he'll want to know about before he can make that front door, hall and all the other details agree with what the producer wishes to convey. Now comes the other side—the severely practical. He will ask "How much of the outside of the house must I show?" "Did I hear you say it was raining heavily?" "Is it daylight or night time?" Then there are things he has no need to ask. They are only too apparent. He knows without asking that, the actress having gone up a flight of stairs, the second part of the scene must take place on the first floor. He knows he must provide at least two doors capable of violent handling and giving out the correct sound of a door being slammed. This all means construction—good solid construction—which will stand the not inconsiderable forces released by a woman rushing about a house at speed.

We are now in possession of enough data to build our definition of scenery in the fullest sense. It is that which gives reality to the aesthetic and practical surroundings of a performer.

So far so good, but we have only defined scenery in a general way which applies to stage, film and television or any other scenery used for a performance. Now let us look at the special problems of the designer of television scenery. We can say at once that he has to face most of the problems met with in the theatre or film studio. Furthermore, there is the necessity for the realism and solidity of film scenery combined with the cheapness, lightness and hence mobility of theatre scenery. This is forced on us for two reasons. Firstly, it must be seen, as film scenery, through a lens which may travel all round it; and secondly, television studio space is used at such a rate that the average production can only occupy it for a matter of hours. It is possible, of course, that studio space will not always be as restricted as it is now. Bigger and better studios will undoubtedly arise one day—and more of them. At the same time it will never be on such a generous scale that the scenery for a single production can occupy it for weeks at a time as is common practice in film studios. It may be asked why. A single comparison can answer. The B.B.C. television station, at Alexandra Palace, is now putting out about a thousand hours of screen time each year, of which about 300 hours is given up to fully scened shows of about 1½ hours each. A film studio doing six 1½ hour films a year is putting out only nine hours. It will be seen at once that the difference in technique must be enormous.

Now what happens when a television producer is given a show to produce and wants scenery? First of all he is given a designer to be his guide, philosopher and friend in all matters pertaining to his material needs. The producer is himself a very busy person. He is responsible for everything—the treatment of the script, the cast, the rehearsals, the scenery, the costumes, the lighting and finally the transmission. He cannot possibly cope with all these things himself. The designer spends the first day or so of production in close conference with him, extracting all details of scenery, furnishings, properties (accessories such as books, letters, swords, etc., used in the performance), costumes, special effects such as rain or rocking boats, and quite a number of things which seem special to each show. One play may need a portrait made of one of the characters and which must look like the actor who is playing the part, another wants a colour effect (such as the red lamp in Chesterton's play "Magic"), translated into some effect that colourless television can reproduce.

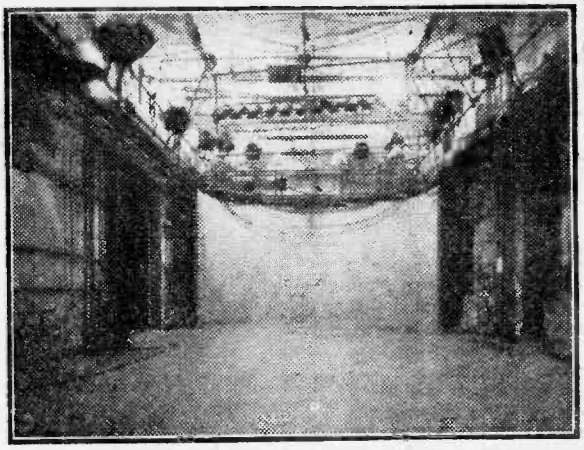


Fig. 3.—A general view of one end of Studio "A." The curved screen in the centre is the "Cyclorama." It is semi-permanent and provides a background for a large proportion of scenes.

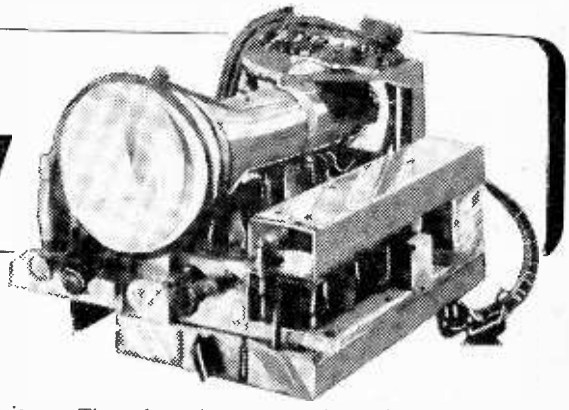
Plans and Sketches

The next process is for the designer to make rough plans and sketches and to correlate these with the lighting experts, the cameramen and others. Then, by a series of compromises, sudden inspirations and helpful suggestions from everybody, scenes are evolved in a very rudimentary form. Then they must be pushed and squeezed into one or other (sometimes both) of the 70ft. x 30ft. studios (Fig. 3). Plans of the studios printed on tracing paper are covered with trial diagrams. First a scene is tried one way and then another. Often it seems to fit perfectly only to be pushed out of place when an attempt is made to fit in scene number two. Also it mustn't be forgotten that the area 70ft x 30ft. cannot be given up wholly to the scenery. Usually more than half of it is given up to cameras, sound booms, lights and other technical equipment. There are also the exits and entrances of the performers to be allowed for. It is no use making a beautiful scene if the actors can't get on or off. (Fig. 1.)

At length agreement is reached on the general layout and with this as a basis the designer begins to draw his elevations (Fig. 2). Of course these processes don't always happen in perfect apple pie order. There is a good deal of research to be done in most productions. This goes on right the way through. The producer is helped very much if the designer can make him rough sketches from time to time to show him just how his actors will look at certain moments. To do this the designer must already have clear ideas in his mind as to style and period. So, by the time he is doing his elevations, he has amassed quite a lot of knowledge from the script itself, the producer and probably dozens of works of reference.

(To be continued)

Using the VCR-97



Points to Consider in the Design of a Receiver Using This Tube

By R. SHATWELL

THIS article has been inspired by the many queries that have appeared in the correspondence columns of our companion journal, and as a guide to the new northern and midland viewers entering this field. It deals with the design of a TV set using the VCR97 and ex-Government components. It is not intended to be a detailed constructional article, since all the separate sections of the set have been covered in technical articles, but will discuss the methods open to the prospective constructor once the decision to build is taken.

The first, and one of the most popular up to recently, is the use of ex-Government units, slightly modified. This is not the simplest method; the result tends to be bulky. It is, despite the fact that good results can be obtained, still a makeshift, and teaches the constructor little. If it works, all is well; if it does not, the inexperienced constructor is often in despair.

The kit method of construction is the most popular at present, and has many advantages. It is designed as a TV receiver, no waste material accumulates, and results are usually very good. However, once again, if it works, etc. An information service is run by most of the firms supplying these kits, but the constructor learns little by following instructions without knowing the why and wherefore.

The last method is to design a set and build it from ex-Government components, obtained as components or as units to be stripped down. In the writer's opinion, this is to be preferred, not necessarily from the point of view of results, as kit construction meets this requirement, but from the view of satisfaction, and, most important of all, extension of the use of the receiver.

It is assumed that readers of this journal have some reasonable knowledge of radio construction. The first step to be taken should be to try to *understand* how the television set functions. Up to the video stage no difficulty should arise, normal radio practice and principles are followed, and the risk of instability is lowered due to the wider bandwidth and consequently lower gain per stage.

Points to bear in mind in design are, in the writer's opinion:

1. Flexibility. The VCR97 gives good results and is ideal for gaining experience of television, but the ambitious will not be satisfied with it for ever.

2. Compactness. The tube is bulky and the need to keep the mains transformer and speaker field away from this limits the size to which the set can be reduced, but a sprawling layout must be avoided.

There have been many dogmatic assertions about operating voltages, shadows, neck diameter, etc., of the VCR97, but the fact is that some tubes do have a shadow. Normally, however, operating at full E.H.T., if a shadow exists it is in a region that it is difficult to reach with a good picture, and is only of interest if it exists on the Y axis. Operating voltage also depends largely upon what one considers a good picture, but it must be borne in mind that the higher the voltage the better the definition, *and* the greater the scan power needed. A compromise is usually necessary.

Bearing these points in mind, the writer has designed and constructed a set, which, operating north-east of Manchester with a home-made aerial, received the daily 1,000-watt test transmissions from the Birmingham district when they started, and has given outstanding results on the present full-strength transmissions.

Ex-Service Units

Two ex-Government units were utilised: the type 62 indicator and the receiver 1225. These were very good value for money. The 62 contained 16 SP61s, 2 EB34s, 2 EA50s and the VCR97. Numerous condensers and resistances were also contained, but *test all condensers at working voltages.* Approximately 50 per cent. of the tubular condensers were rejected with leaks. The 1225 contains 5 EF50s, 2 EF37s and one EB34, and has a useful supply of .01 μF mica condensers.

There are, no doubt, other and perhaps better combinations of units, the main requirements being an indicator unit and ample supply of valves. The total cost of set, aerial and power unit, less speaker, was in the neighbourhood of £15 to £16, and the cost of the units has since fallen.

In order of decision, the following points must be decided before construction is started:

1. Straight set or superhet.
2. Unit construction or single chassis.
3. If unit construction, division of units.
4. Order of construction.

The opening of a second station and possibility of a change of residence makes superhet construction almost the only choice. In the writer's opinion, the superhet is also easier to line up and more stable, and the following deals with the superhet, although the principles apply to either form of construction.

Two chassis at least seem to be inevitable to separate the power supplies and speaker from the tube, and a form of unit construction is more flexible than single chassis

and, with care, need be no more bulky. The set can therefore be split into one chassis for power supplies and speaker, and a single assembly of small sub-units for receiver and time bases. The receiver is broadly the same for any type of tube, and can, therefore, comprise one unit, but it is convenient to separate the vision I.F. channel from the rest of the receiver. The video amplifier, from hum bar considerations, is better included with the vision I.F. unit. Synchronising separation can be the same for electrostatic or magnetic tubes, but time bases differ radically and should, therefore, form a separate unit. We then have four sub-units of the receiver chassis as follows :

1. Signal frequency stages, F.C., sound channel and audio output.
2. Vision I.F. and video.
3. Synchronising separator, including cathode follower feeding tube grid.
4. Time bases.

The most effective distribution of these units, for easy modification and compactness, is along the length of the tube in strip form. Chassis width can, therefore, be divided into five sections, one section for vision channel, the next two taken by a single chassis for the signal frequency stages, etc., the next by the sync separator, and the last by the time bases. The photographs should make the idea clear. The vision I.F. chassis consists of two chassis facing each other, the valves (SP61s) being alternately inverted with the caps *inside* the opposite chassis. These two chassis hinge about a third section at the rear, carrying the video components and limiter. Covers to the chassis hinge for servicing and holes are provided for aligning and for the insertion of a prod to contact the valve grids during this procedure. The complete receiver assembly measures 11in. from top of tube to underside of chassis covers, and is 13¾in. wide.

It is not intended to give a theoretical diagram of the set (any of the *Practical Wireless* circuits published to date can be accommodated in this form of construction), but a description of each stage follows. First, 2 R.F. stages, frequency changer and oscillator (EF50s and EC52) covering 61.75 to 58.25 Mc/s by staggered tuning, oscillator coil air-spaced and suspended across split stator tuning condenser. These are common to sound and vision. Vision I.F. unit 13 Mc/s I.F. single side band to 10 Mc/s 3 stages (SP61s) with 9.5 Mc/s rejectors, video amplifier (EF50) and vision limiter (EA50).

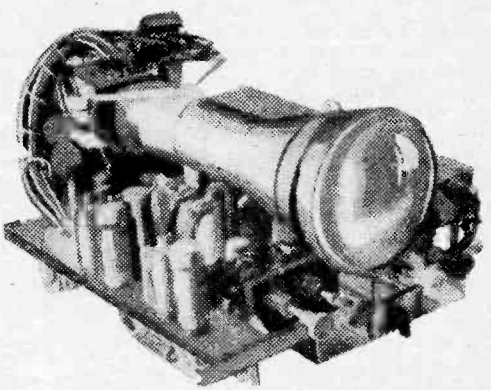
The video stage is designed for direct coupling to a magnetic tube, and the output taken off via a .1 μF condenser, which will be dispensed with on conversion.

The sound channel I.F. is 9.5 Mc/s with close coupling giving a bandwidth of approximately 100 kc/s to allow for frequency drift. These I.F.s are becoming quite popular in commercial superhets but, since they are in a well-populated section of the short-wave band, screening must be good to prevent direct pickup. Two stages are used (SP61s) and an EB34 provides detection and noise limiting. A 6C5 L.F. stage and 6V6 output provides excellent quality feeding a 10in. speaker. Feedback is applied to the 6C5 by omitting the cathode by-pass condenser.

Video output feeds the tube via a cathode follower (SP61) with an EA50 as D.C. restorer. Anode output from the cathode follower feeds the synchronising separator, which is a two-valve circuit combining limiter and slicer principles (SP61s). The interlacing is extremely good on the full power transmissions, as can be seen by turning up the brightness until the interlaced flyback and the top and bottom half-line are visible. On this chassis a spare valve space is left alongside the cathode follower for future use.

Time Bases

The time bases are Miller integrators with paraphase amplifiers (2 SP61s each for frame and line). Linearity is good, but care in the design of the frame time base is necessary to obtain this and high scan to flyback ratio. A close approach to 20 : 1 has been obtained with good linearity. Line scan flyback presents little difficulty, but high output must be aimed at. A 5in. picture width needs approximately a 5½in. scan due to the blackout of part of the scan by the synchronising signal. This was obtained with an E.H.T. (smoothed) of 2,200 volts and anode supply of 480 volts to the time bases, applied in each case through a 47,000 ohm 3 watt load. Picture width is not controlled, but a picture height control is



Another view of a home-made receiver using ex-Service units and the VCR97.

fitted consisting of a wire-wound 10,000 ohm variable in the 480 volt line to the frame valves, by-passed by a 25 μF 25 volt bias condenser. The picture is bright enough for viewing in daylight or artificial light, provided the screen is in shadow. Focus is good and reasonably constant over the whole scan area.

The E.H.T. distribution panel with X and Y shift distributors is mounted across and above the tube base, on a gantry from the back of the set. Presets for height, X shift, Y shift, noise limiter, etc., can be conveniently mounted on these supports. Focus, brightness, volume and contrast are panel controls. All coils are wound on formers made with gummed paper strip, dried and shellaced, with brass cores. Rejector coils have iron dust cores, as have the sound channel coils.

Order of Construction

It is unfortunate that the least interesting part of the work must obviously be the first step, but nothing can be tested without the power unit, therefore, this should be completed before the rest of the set is started. Outputs required are 500 volts at 250 mA, dropped to 300 volts for the normal H.T. requirements, 6.3 volts at 10 amps, 5 volts 3 amps and E.H.T. 2,000 to 2,500 volts at a few milliamp, with 2-0-2 for E.H.T. rectifier, and a highly insulated 4 volt lamp for tube heater. The writer wound a combined transformer at a cost of approximately 25s. and a lot of patience. A lot was learned of the pitfalls of E.H.T. transformers, but in

view of the low cost of these items at present, it is recommended that one of these be used, and home construction confined to the H.T. transformer. A 4¼ sq. in. core was used (ex-Government) giving a very low number of turns per volt (2 T.P.V. is ample basis for calculations). 5U4 rectifiers are cheap and plentiful, and an ex-Government thermal delay switch connects the reservoir condenser after 30 seconds preventing condenser breakdowns, and avoiding sparking of delay contacts and heavy current through them. Choose one that resets reasonably quickly. The one in use is made by Bulgin and resets in about one minute. Outputs can be taken to two valveholders mounted on a paxolin panel clear of the chassis, one taking the H.T. and 6.3 volt supply, the other the E.H.T. negative (positive being earthed) and tube heater supply. Smoothing must be good for both H.T. and E.H.T. oilfilled 3 μF 2,000 volt condensers are available at a very low price and are ideal for E.H.T. smoothing. They will stand up to 2,200 volts without any trouble. When the set is completed and assembled, use can be made of the Government surplus 1,000 ohm 30 watt vitreous resistors to provide the 300 volt line, but during testing of the various units this needs varying values to provide 300 volts at whatever current is being taken. The reservoir condenser can be left disconnected until most of the units are coupled, preventing too high a voltage developing across the rectifier.

The more interesting work can now be started. A tag board containing the E.H.T. distributors and X and Y shifts can be assembled, and the tube temporarily mounted along with this board and the shift controls and brightness and focus controls on a wooden base board. This done and tested, the time bases can be started.

These are assembled on a strip chassis 14in. long and 2¾in. wide, the valveholders being offset to allow a long tag board to be mounted alongside them under the chassis. All components can be wired on this tag board and leads taken off to the valveholders and frequency controls. Twin shielded cable is used to feed the outputs to the deflector plates. The time bases can be perfected at this stage, whilst easily accessible. Frame linearity is observed by comparison of the spacing of the lines at top and bottom of the raster, and a close approximation of the scan to flyback ratio can be obtained by adjusting frame frequency to 50 c/s., which will usually be obvious by a *slight* shading of the raster moving over the screen at low brightness levels. When this is stationary the frame frequency is set at 50 c/s. This done, set line frequency at approximately 10,000 c/s. By counting the lines on, say, 1in. of the centre of the raster, and multiplying by the raster height, line frequency can be approximately checked. 200 lines will be drawn at 10,000 c/s. This is not so difficult as at first appears. The aim is now to keep the flyback lines, visible over the raster, as low as possible, 10 lines being obtained with a 20 : 1 scan to flyback ratio. Don't despair if this cannot be reached, 15 : 1 gives quite good results. The condenser between anode and grid of the time base oscillator largely controls flyback ratio, but compromise is usually necessary between flyback and output. Only minor adjustments to frequency should now be necessary when the set is completed, provided the correct voltages have been applied during the test. The frequency of the Miller integrator is very susceptible to voltage changes.

The synchronising separator and cathode follower chassis should now be constructed on a similar chassis and again with tag board assembly (tag boards will be obtained in the indicator). A spare valve hole should be punched next to the cathode follower for subsequent modifications. This and the time base chassis can be screwed together and synchronising outputs coupled up. Apart from running tests to check for shorts and overheating, little can be done to test this unit, so care should be used in its construction to avoid errors.

Next, the vision I.F. unit with detector (EA50) video amplifier, and vision limiter, should be completed. If a 62A indicator is obtained in place of the 62, 12 of the SP61s are replaced by EF50s, and probably a simpler chassis than the double one could be used by using these valves. Dimensions are similar to the previous units. 'Phones can be used to line up the channel, connected either to the detector or video amplifier, and a signal generator covering 15 Mc/s to 9 Mc/s is essential. Quite a simple affair is sufficient, however, and can be calibrated against a reasonably accurate receiver.

The R.F., F.C. and sound chassis are next, and are twice the width of the previous units. The stages run from aerial at the back to oscillator at the front and back down the opposite side to output alongside the aerial socket. The output transformer is not included in this chassis, but is mounted on the framework upon which the chassis are all assembled. SP61s, EF50s, or EF37s, can be used in the sound I.F. channel. Co-axial cable picks off the vision channel and feeds it to the appropriate chassis.

Testing

The sound channel is easily tested, as is the frequency changer, using a 9.5 Mc/s modulated signal. The R.F. stages can be aligned, and the oscillator set, using the fourth harmonic of the signal generator, set at the appropriate frequency between 14 and 15 Mc/s. The oscillator is set, using the sound channel output with the generator set at 14.562 Mc/s (approximately), and feeding the grid of R.F. 2. The oscillator is then left alone and the adjustment to the signal frequency circuits made, using the audio output from the vision channel I.F. unit as guide to the correct setting.

Accuracy should be sufficient to enable a signal sound and/or vision to be picked up by adjustment of the oscillator tuning with aerial connected, when the correct generator setting can be obtained precisely, and final checks made. All stages working they should be mounted alongside each other on two strips of angle aluminium and the temporary tube mounting dispensed with, the tube being transferred to the completed chassis and the gantry carrying the presets and voltage distribution panel fitted. Note that the focus and brightness controls must be mounted on an insulated panel and control extensions coupled through insulated couplings (provided by the 62 indicator). On aerial tests results should be inevitable, as only the cathode follower and synchronising circuits have not been proved to be in order. In this unit the screen and cathode voltages are critical and potentiometer control of these may be necessary until optimum voltages are ascertained.

Please do not write to say that a higger picture can be obtained, E.H.T. can be higher or lower, or that shadows do or do not exist on the VCR97. I am satisfied that discrepancies do exist, some due to age of tubes, and, perhaps, tubes that did not meet the stringent Government specification are now on the market. I am, however, satisfied that results at least equal to those obtained on the set described are possible with any new ex-Government tube, i.e., approximately 5in. x 4in. picture of good definition and adequate brightness, assuming some patience and research by the constructor.

TELEVISION PRINCIPLES AND PRACTICE

3.—Scanning—Dissecting the Image—The Electron Multiplier

By F. J. CAMM

THE current variations may be amplified and transmitted in the usual manner to the receiving set, where they are detected and fed to a form of electric lamp whose brightness they control. Further, the light from this lamp is focused on to a strip of light-sensitive paper moving between spools at exactly the same speed as the paper strip at the transmitting end. The strip is developed by chemical means after it has completely passed through the spool, when it will be found that the original design appears as a photographic image.

Now this is the foundation of radio vision and transmission, by whatever name it is known.

The simple experiment with a photo-electric cell given last month demonstrates how the systematic exploration or scanning of a picture is carried out, and how by an elaboration of the process we are able to transmit a complete picture in a series of tiny bits which are re-assembled on the viewing screen.

For example, assume that it is desired to transmit a photograph of 10 in. length and 6 in. width. Further assume that the beam of light passing through it, to the light-sensitive cell, has a cross-sectional area of .1 in. by .1 in. If the photograph is passed once vertically downwards across the beam in the manner of the strip shown last month, a strip of the picture of irregular shading 6 in. in length and .1 in. in width will be transmitted in the form of its electrical counterpart from the sending aerials and be picked up on the screen of the receiver.

This, however, is only part of a photograph, and to transmit the complete picture it is necessary for it to be passed downwards across the light beam 100 times, moving .1 in. sideways after each vertical traverse. Fig. 8 indicates how the whole area will be covered in this manner in the form of electro-magnetic waves with an intensity varying according to the intensity of the shading.

The television receiver detects, amplifies and causes these waves or electro-magnetic impulses to control the brightness of some form of lamp. A photographic plate or sensitised paper sheet is moved vertically downwards in front of this lamp, the light from which is focused on to the area of the plate measuring .1 in. by .1 in., precise synchronism being maintained with the transmitter regarding horizontal and vertical movement so that 100 strips, 6 in. by .1 in. and located side by side, cover the area of the plate or paper. By ordinary photographic development a copy of the original picture is obtained.

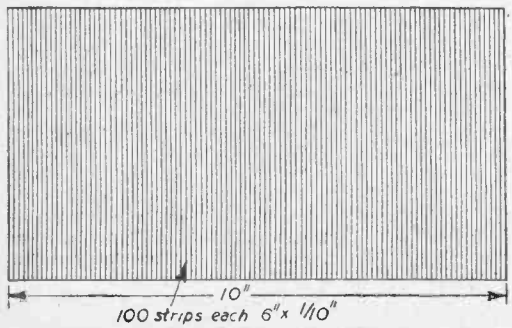


Fig. 8.—Diagram showing how the picture area is built up by the system shown in Fig. 7 (last month's issue).

This process of exploring an area, so as to obtain a current that varies in accordance with the light intensity of each tiny piece of the area, is known as scanning, and all television systems make use of one form of

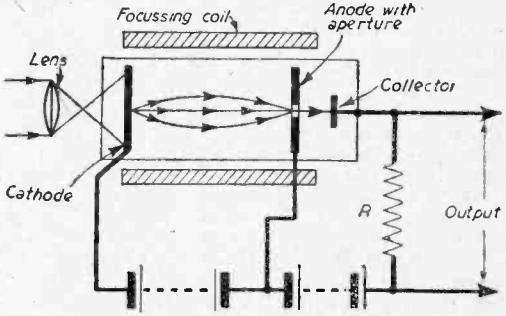


Fig. 9.—Diagram showing the principle of the image dissector.

scanning system. The area of the light spot which explores the surface is very small indeed in relation to the total area of the picture, and this is necessary in order to avoid distortion. It is impossible to transmit details of the picture which are smaller in area than the cross-sectional area of the beam, in the case cited this being .1 in. x .1 in. = .01 sq.

Dissecting the Image

One of the earliest devices for dissecting an image was that developed by Farnsworth, and it certainly was one of the most successful of the scanning systems used for television. It resembles in operation a cathode-ray tube, and its principle is shown in the diagram (Fig. 9). It will be understood that the whole of the parts indicated are located in an exhausted glass bulb with the exception of the focusing coil. The internal electrodes are the cathode, the anode and collector electrode. It will be understood that the cathode does not resemble that used in a wireless valve, but consists of a translucent slab of insulating material, the surface of which is coated with a photo-electric or light-sensitive

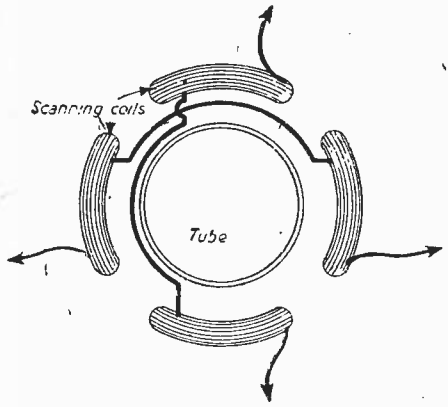


Fig. 10.—Arrangement of the scanning coils around the dissector tube.

material. The lens system is arranged so that a clear image of the scene to be televised is focused on to the translucent cathode and each elementary area of this will emit a stream of electrons proportional to the light intensity falling on to that particular part of its surface. The anode is kept at a high positive potential with respect to the cathode, and thus the electrons escaping from the cathode are attracted towards it.

Surrounding the device is the focusing coil which carries a direct current producing an almost uniform magnetic field running parallel with the horizontal axis of the tube. The intensity of this field is adjustable, made possible by changes in the direct current which creates it. Any adjustment made to this current in relation to a given anode voltage will cause electrons emitted from any point on the cathode to be focused as a fine spot on a particular part of the anode, as shown in Fig. 9, and this notwithstanding the fact that not all of the electrons emitted from a particular point on the cathode will move directly across to the anode, parallel with the lines of magnetic flux. The electrons emitted directly parallel to the flux lines are not subject to any force, but others which are emitted with a radial component of velocity follow helical paths and intersect the direct parts of the anode. All electrons emitted from the same spot on the cathode converge at the same point on the anode irrespective of their initial direction or velocities, which means that there is formed at the anode a plane of distribution of electrons which is a replica of the light intensity upon the cathode.

Thus we have in electronic form a replica of the scene being televised, and at this stage it is scanned by a system which causes a displacement of the image with respect to the anode aperture. There is a small hole in the centre of the anode through which a certain number of electrons may pass to the collector plate, and if the electron image present at the anode plane is moved sideways and upwards across the anode aperture, the number of electrons passing through will vary from instant to instant according to the light intensity at that part of the cathode image supplying the electron at a particular instant.

It is not proposed at this stage to deal with time-base circuits and the manner in which the electron image is moved in this way will be dealt with under that heading. It can, however, be briefly stated here that it is accomplished by means of a pair of magnetic coils (not to be confused with the focusing coil), mounted on either side of the tube in the manner shown in Fig. 10. The electron image is moved up or down when a current is passed through the coils mounted vertically whilst horizontal movement is caused when a current is passed through the horizontal coils. By applying to the vertical coils a current of saw-tooth wave form, as indicated in Fig. 11, and having a frequency equal to the number of times per second the image is to be scanned, and applying

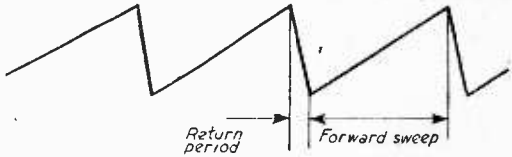


Fig. 11.—The image dissector makes use of a wave of saw-tooth form, as shown here.

a similar wave to the horizontal coil of a frequency equal to the number of sweeps, lines per frame multiplied by the number of frames per second, the electron image is moved across the aperture as a series of parallel strips disposed side by side and building up *in toto* the complete area of scene being transmitted.

The Electron Multiplier

We have already seen that the anode aperture of the image dissector must be small, in fact, the smaller the better, if distortion is to be prevented. A point in size can be reached, however, below which insufficient electrons pass through to the collector plate to cause sufficiently large voltage variations across R (Fig. 12). It is not practicable to employ high amplification to remedy this state of affairs because the very weak signal would be swamped by valve noise. Therefore, to get over the difficulty, electron multiplication is made use of. Figure 12 shows one form of electron multiplier which is built into the scanning tube.

It will be seen that two plates are so mounted that they face one another and their inner surfaces are coated with a material which will radiate a large number of secondary electrons when subjected to primary bombardment (see A and A1). A tube or circular anode is mounted between these plates carrying a potential of between 90 volts and 100 volts. Connected to the electron multiplier between A and A1 is an oscillator which generates a potential at radio frequency of about mego cycles per second.

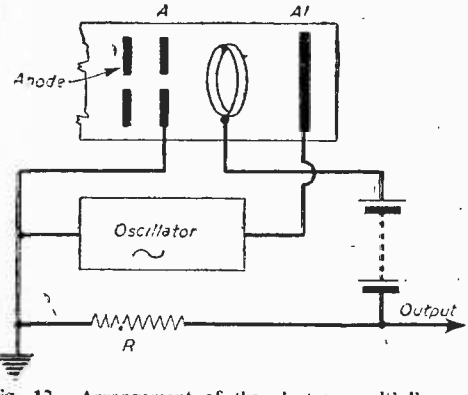


Fig. 12.—Arrangement of the electron multiplier.

(To be continued)

Pre-amplifier for Sutton Coldfield

A Unit for Improved Long-distance Reception of the Midland Service

By A. W. DALE

THE pre-amplifier described here has been designed for long-distance reception of the Midland vision transmitter, and has proved to be capable of providing clear and well-synchronised pictures at all times at nearly 100 miles from the transmitter using a standard H aerial of doubtful efficiency.

The aim of the design is to provide a higher gain than the usual types of amplifier, and this is made possible by the fact that the transmitter sideband covers a bandwidth of only 2.7 Mc/s. Thus, the anode loads have been made fairly large and there is little damping of the tuned circuits from this source. These circuits are tuned to the vision channel, since the sound reception is a relatively simple matter and sufficient gain is provided by the amplifier of the sound signal without widening the bandwidth farther.

The valves used in the original circuit were EF54s (VR136); but EF50s or 6AC7s could be used instead, the only alterations being that the suppressor grids of these latter valves are brought out to pins on the valve bases, and these should be taken to the chassis (the suppressor of the EF54 is internally connected to cathode). Also, a turn or so may need to be removed from the coils L2, 3, 4 and 5 with these valves. Most of the components may be obtained from the spares box or cheaply from surplus stores.

Layout

The chassis diagrams are intended to suggest a layout to the constructor, and the exact dimensions need not be adhered to, but it is important to see that the valve-holders are fixed in the manner indicated, or the advantages of this layout which make for ease in wiring the components will be lost. Fixing holes for the valve-holders have not been shown, since their positions may vary slightly for different makes of holder. The inter-stage screening shown in diagram 3 is a vital factor in the prevention of self-oscillation, although the screens AA may not be required, but the use of a baseplate is recommended. The method of fixing and dimensions of these screens have not been specified, as they will depend to some extent upon the sizes of the components used.

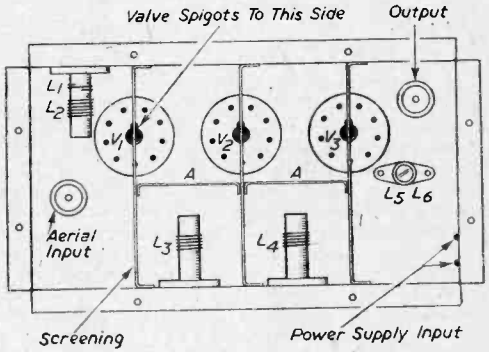


Fig. 3.—Layout of the main components—underside view.

The ⅜in. holes drilled at the base of each coil former permit access to the cores for alignment purposes. A fairly deep chassis has been used to prevent the coils being too near to the screening. Any available sheet metal of fairly stout gauge may be used for the chassis construction and any type of co-axial sockets for the input and output connections.

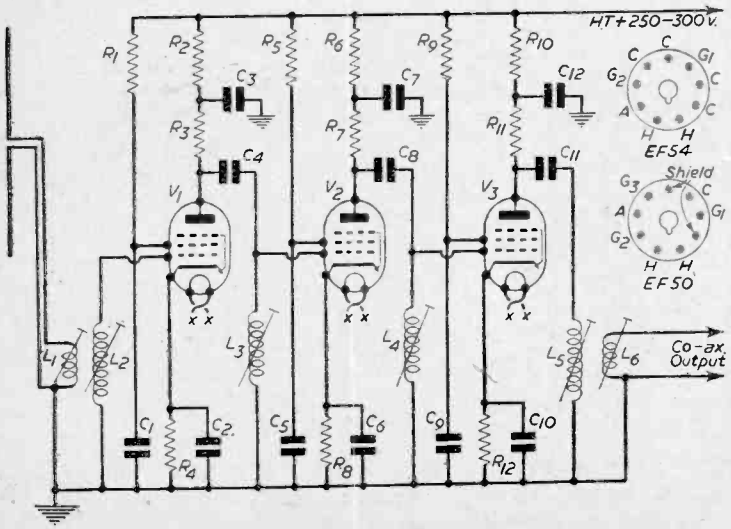


Fig. 1.—Theoretical circuit of the pre-amplifier. A list of components will be found on the next page.

Wiring

No special precautions are needed in the wiring other than the careful anchoring of earth-leads to the chassis and the screening which must be securely bolted in, as the possibility of self-oscillation is very great unless care is taken over these points.

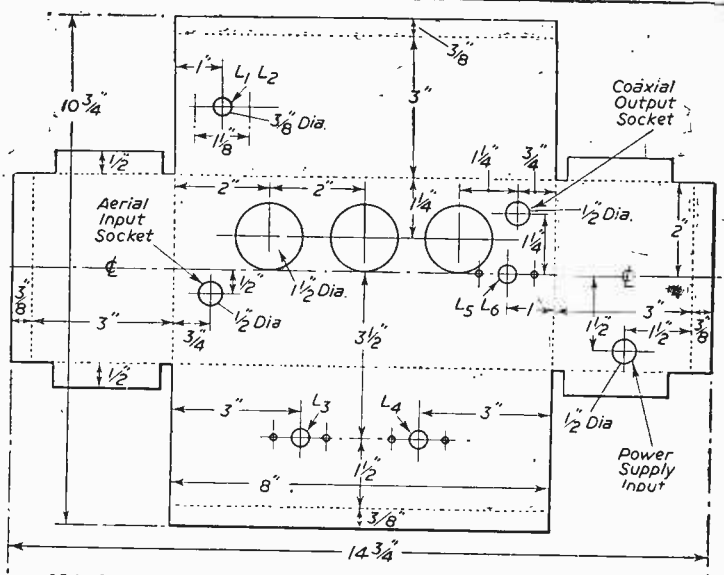
In view of the fact that the signal-to-noise ratio of the apparatus is limited by the noise created by the first valve and its associated circuits, it is advisable to include a "low-noise" resistor for R3 and a wirewound type may be used to advantage.

The alignment procedure should present little difficulty

since some kind of signal (either vision or sound) should be received by adjustment of the core of L1.L2 alone with the remaining cores in the midway position, whereupon all the coils can then be brought to the required frequency by observation of detail in the resulting picture.

Signal Generator

A signal generator will, of course, simplify this part of the work, since it provides a ready means of checking each stage separately, but it should be noted that the tuned circuits should not be peaked at the vision carrier frequency of 61.75 Mc/s, as it is desired to amplify only a single sideband transmission, i.e., frequencies from 61.75 Mc/s down to about 59 Mc/s, and the signal generator should, therefore, be operated at a frequency of about 60.5 Mc/s for this reason. With a little patience, very good quality results may be expected at places well outside the official service area.



6BA Clearance Holes Drilled In All Flanges To Fasten Chassis Ends and Base Plate. Dimensions Of Coil Former Mounting Holes Are All As For L1 L2. Base Plate Size 4¾" x 8¾" Also Required.

Fig. 2.—Chassis details and dimensions.

LIST OF COMPONENTS.

R1, 5, 9 : 20KΩ.
R2, 6, 10 : 3.3KΩ.
R4, 8, 12 : 150Ω.
R7, 11 : 10KΩ.
R3 : 15KΩ.
C1, 2, 3, 5, 6, 7, 9, 10, 12 : 1,000pF.
C4, 8, 11 : 2-500pF.

4 Aladdin Coil Formers (⅜in. dia.).
L2, L5 : 6½ turns 30 S.W.G. Enam.
L1, L6 : 1½ turns 30 S.W.G. Enam. interwound at lower end of L2 and L5.
L3 : 5 turns 30 S.W.G. Enam.
L4 : 4½ turns 30 S.W.G. Enam.
(All turns spaced 1 diameter of wire.)
xx : 6.3 v. **H.T. 250-300 v.**
Valves : 3 of EF54, EF50 or 6 AC7.

Mullard Overseas Limited

THE large and continuing expansion of the Mullard company's business in all parts of the world has rendered it necessary to segregate its export activities from its home trade.

To achieve this a new private company entitled "Mullard Overseas Limited" has been incorporated, with a nominal capital of £250,000. This company will co-ordinate the export trade of the Mullard Co. from the United Kingdom.

Television in New Zealand

THE President of the New Zealand R.M.A., on his return from a visit to the U.K. and U.S.A., announced that a television system will be operating there within five years.

NEWS FLASHES

Broadcast Receiving Licences

DURING the year ended March 31st the following licences were issued :

Region	Number
London Postal	2,326,000
Home Counties	1,637,000
Midland	1,719,000
North Eastern	1,877,000
North Western	1,589,000
South Western	1,051,000
Welsh and Border Counties	723,000
Total England and Wales	10,922,000
Scotland	1,119,000
Northern Ireland ..	202,000
GRAND TOTAL ..	12,243,000

Of the above there were 345,100 television licences issued.

Cup Final Broadcast

THE Arsenal's Cup Final victory was seen by an audience which included over 1,000 experts of the C.I.C., at the Odeon, Penge, Kent, on a standard cinema screen 20ft. by 15ft. The demonstration was arranged by Cinema Television, Ltd., and the definition was almost as good as that of the newsreel taken under similar conditions. The definition and absence of flicker was a surprise to those who had not before seen modern projection equipment, and in many of the shots the mesh of the goal nets was seen quite clearly.

Presentation Set

MISS ANNETTE MILLS performed an "opening ceremony" at the Y.M.C.A., Chatham, when a Baird Countryman receiver was installed in a special viewing room for the use of the Forces.

Portable Micro-wave Television Link

Details of the Latest "Standard" Development

EXPERIENCE suggests that many memorable television programmes of to-morrow will probably be televised elsewhere than in the studio. Already in England and the United States sporting events, on-the-scene news items, and human interest subjects generally have been taking the televiewing public further and further afield for some of the "high lights" of television entertainment.

Fully alive to this great wealth of potential programme material, experts on both sides of the Atlantic have been working on the essential problem of making the television camera as fully mobile as its associate, the microphone, which, under "sound only" broadcasting, took the listener almost everywhere.

As is well known, television signals occupy a bandwidth of the order of 3 megacycles and television broadcasting, sight and sound, requires a frequency allocation of about 6 megacycles or some six hundred times the allocation for "sound only" broadcasting. For linking up television transmitters, studios and "outside broadcast" locations, circuits capable of transmitting the necessary wide band can best be provided by means of coaxial cables, radio links, or a combination of these two types of circuit. Obviously where mobility is required, a radio link must be used—in general, to provide a connection to the nearest point of a suitable cable.

The micro-wave range of the radio-frequency spectrum is selected not only because it affords the necessary space for the band width but also on the score of portability.

Suitcase Equipment

Leading manufacturers of coaxial cables, Standard Telephones and Cables Limited have taken the lead also in developing portable or, as the Americans term it, "suitcase" micro-wave television links. The purpose of these equipments, which represent a considerable advance on previous designs, is literally to bridge the gap between outside broadcast camera and either the transmitting station or some convenient point on the network of television cables.

A few details of the latest "Standard" development in this direction may be of interest since the equipment has already undergone satisfactory service trials with the B.B.C. and was brought into public service for the Boat Race television transmission on April 1st. It consists essentially of individual transmitters and receivers made up into lightweight portable units which can be easily and quickly set up to afford an effective high-grade micro-wave radio link, which is in marked contrast to the two large vehicles previously employed. A transmitter and receiver may also be connected together to serve as a repeater station joining two radio links in tandem in instances where a single transmitter and receiver would otherwise be out of optical range of each other; with micro-waves, point-to-point communication must virtually be "line of sight."

Portable units which go to make up the complete transmitter consist of a 4ft. diameter paraboloid aerial and a control unit. The former has a transmitter-modulator mounted in a weather-proof canister above it. From here, electro-magnetic "centimetric" waves are led down to the focal point of the reflector by means of a waveguide terminating in an electro-magnetic horn. The complete receiver has a similar aerial unit with a micro-wave receiver mounted in another weatherproof canister. Other portable units comprise a power unit, I.F. unit, and discriminator unit. These require some weather protection when used in the open.

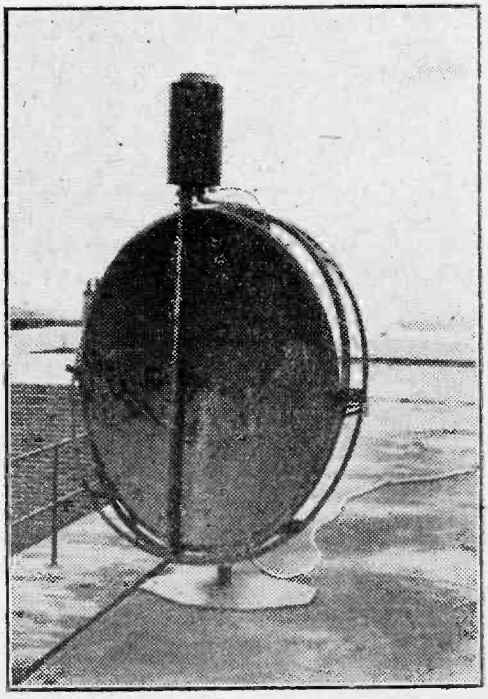
Small Loss

The complete radio link has zero overall loss, accepting a standard television wave-form of 1 volt amplitude from a 75-ohm coaxial line and delivering a signal of the same amplitude at the receiver output. The transmitter employs a velocity-modulated coaxial line oscillator while the receiver uses a local oscillator as heterodyne and a crystal mixer followed by a 60 Mc/s. intermediate-frequency amplifier, a 60 Mc/s. discriminator and a video amplifier.

The amplitude-frequency characteristic of the link is flat from 25 c/s. to 5 Mc/s. and is, therefore, more than adequate for transmission of standard British 450-line television.

The beams from the paraboloids are approximately 5 deg. wide and it is ordinarily sufficient to set up the transmitter and receiver aerials on the correct compass bearings as read from a map.

The introduction of these readily portable micro-wave links greatly extends the scope of outside television broadcasting beyond the network of coaxial or other cables and brings a wealth of programme material within range of the television camera.



The aerial unit used for the first time in relaying the Boat Race.

X-Rays on Alexandra Palace

No.1—Picture Page—By the Marquis of Donegall

YOU can hardly call "Picture Page" a naughty baby or an unruly child. It is television's oldest feature.

Shall we content ourselves with "unpredictable adult"?

Every Wednesday, Alexandra Palace puts on my favourite feature. Part of the fascination, if you know the inner workings, is that complete disaster—fade out—is escaped by a hair's breadth at each edition. Anything can happen on "Picture Page," as will become clear when, later in this article, I let Cecil Madden, its creator in 1936, speak in his own words.

In the meantime a little background history.

As most people know, television programmes started at Alexandra Palace in August, 1936. But there is a story behind that when Gerald Cock said to the staff that had been recruited: "You have four months without anybody expecting you to do any programmes at all. So you can take it easy and get to see how cameras work and what lighting is like. In fact nobody really knows much about it."

This staff for the future television service was recruited from all sorts of places. Cecil Madden, for instance, was selected as programme organiser, as he had commercial experience, broadcasting experience and stage experience of all kinds.

When they got up to their offices at Alexandra Palace Gerald Cock was on the line from Broadcasting House, and he said: "Wash out everything I have said. We start our television programmes in ten days from now for Radiolympia." That, as I have had it described to me by one of those concerned, was rather like being thrown into the deep end without any knowledge of swimming.

Cecil Madden summoned the staff together and said that they had got to produce a show immediately. So he produced, with George More O'Ferrall as his assistant, a half-hour review called "Here's Looking At You."

After that they did the show every day on the Baird and E.M.I. systems for ten days.

Then they got the respite that had been promised them for studying of some four months. It was during this study-period that Cecil Madden created "Picture Page." The way it happened was that Gerald Cock, who was after all the boss of the whole show, said: "We ought to have a topical magazine."

It was Gerald Cock who created the name "Picture Page," but it was Cecil Madden who got the idea of the telephone switchboard, which some of us remember, in order to get from item to item. He "found" Joan Miller, whom he knew at the time. She was a Canadian actress and used to plug in on the telephone switchboard, saying: "You'd like to see someone interesting who's just arrived in London?" Then she said: "You're through," and plugged in. And up came the interview with the particular person of interest. This switchboard idea of introducing television's version of "In Town To-night" on the radio went on for 18 months. Then Gerald Cock got bored with it because people at cocktail parties all over London used to smack him on the back and say: "You know, you're through, old boy!"

Well, it got on his nerves, and eventually he told them to think up some new idea.

They then evolved a reception desk and the advantage of that was that the names were written up as the various celebrities or acts appeared. You could therefore tell, if you came in late on the programme, what you had missed. Now, of course, the whole thing is more informal and done quite differently. Pre-war "Picture Page" ran for 262 editions and was the last evening programme of all before war darkened the screen.

First Male Announcer

Leslie Mitchell was the first male announcer and interviewer right from the beginning in 1936. Various producers, including George More O'Ferrall and Royston Morley, were responsible for it. Later, Madden started the idea of "Picture Page" becoming a training ground for producers with a different hand behind it each week.

By its very nature, "Picture Page" calls for very quick thinking. When the programme has been organised at the office end, they hand it over to the production side on the very day of the show. Even now, by reason of its topicality, it only starts rehearsing about 5 p.m. and goes on the air some four hours later. When you think that a play on television rehearses for

Leslie Mitchell interviewing Tyrone Power, the American film star, at one of the Picture Page sessions.

two whole weeks, amounting to three week's work for the actors concerned, a couple of hours' rehearsal of " Picture Page " is pretty smart work.

Joan Gilbert came into the " Picture Page " business in 1938 as sub-editor. She had been working on the B.B.C. " In Town To-night," and after the war took over " Picture Page " completely. She has naturally good sense and knows the background of the people she is dealing with. She has made it a personal thing—in fact, a whole time job—except when she is occasionally co-opted to do a fashion parade or something of that kind.

As one of the " Girl Friends of the Forces " during the war, Joan Gilbert was hostess at Overseas League parties, and in " Calling Gibraltar," she was a member of Cecil Madden's Overseas Entertainments Unit, operating from the Criterion Theatre—well underground—giving radio cheer and messages to the Forces serving overseas.

Leslie Mitchell joined the B.B.C. originally in 1934, although he had broadcast as early as 1929, when he took part in the Armistice Day broadcast of " Journey's End." He came to television from being a producer in the variety department of the B.B.C.

" Picture Page " has always operated on a system of scouts. These are people who do not work in the B.B.C., but tip off on interesting characters who happen to be available for that particular edition. In fact, the thing gets put together like any normal printed magazine. One could carry the analogy even further by saying that press day of a normal magazine is usually a panic and that " Picture Page " certainly follows the tradition.

I asked Cecil Madden whether they had any funny pre-war incidents in connection with " Picture Page." We were sitting in my library at home and he talked into the microphone of my wire-recorder. So let him speak for himself :—

" The night the toucan got away—(To get another drink ?—D.)—and flew up on to the lighting bridge. It had been in a Zoo show but the more anybody tried to climb up and capture it, the more it made rude noises and perched itself elsewhere. We tried to start the show but the thing became completely hopeless and we accepted defeat.

" I remember a funny incident when, sitting at the top of the tower in my office, the telephone rang. A voice said : ' The Emperor of Abyssinia to see you, sir.' ' Is this a gag ? ' ' No, sir, the Emperor of Abyssinia to see you, sir.'

" So I went down and there was the Lion of Judah himself surrounded by several Rases and some small editions of himself. He had apparently heard that Alexandra Palace was an interesting place to see and on the natural principle that Emperors are welcome anyway, at any time, he decided to pay us a courtesy call. We had a little difficulty persuading him that even Emperors and their retinue fail to add to the efficiency of a programme if they walk in front of the camera. But it must have passed off fairly well because Haile Selassie paid us another visit at a later date.

Unexpected Incident

" Now you remember Don, the famous American film dog, ' Asta,' that appeared in ' The Thin Man ' ? To the horror of his owner, Asta, who had performed tricks all over the world, refused to do anything and just skulked in a corner of the studio. With the usual optimism, we thought that Asta with a little relaxation and a bone, would probably be back to himself for the transmission. We could not have been more wrong. What had actually happened was that there had been a snake in the same studio on the afternoon transmission. The dog had smelt this at once and his fear of snakes had proved stronger than his undoubted genius for public performance.

" We are always up against such unexpected incidents and by the very nature of ' Picture Page,' there is no time to do anything about it when little ' contretemps ' occur.

" Now Leslie Mitchell is a resourceful character whom it is very difficult to defeat. I remember one time that he had to deal on ' Picture Page ' with a charming old missionary—a long flowing white beard and all. This distinguished old gentleman had lived for some years in the Polynesian Islands and translated the Bible into Paumotu. Leslie asked him a lot of questions at rehearsal to which he unhesitatingly answered : ' Yes.' But on transmission, he was disconcerted when the missionary answered ' No ' to every one of the questions. (Fade out, of course !)

" It transpired that he was stone deaf and had not heard a single word, either at rehearsal or on transmission, and that nobody had ever suspected such a thing.

" Once we were honoured to bring in a wonderful character, the Grand Vizier of Morocco, who had just arrived in London, and he had to go on transmission without any rehearsal at all. Leslie Mitchell went into a long preamble about the honour that His Excellency was paying to British television, etc., etc. To which the Grand Vizier replied in French : ' Ask me something.' Mitchell then went through his grand preamble all over again and the Grand Vizier replied in French again : ' Ask me something.'

" As there seemed to be very little likelihood of the interview getting on to a more sensible basis, a tactful fade-out deprived posterity of the Grand Vizier's weighty thoughts.

" Just one more incident in the casebook. It fell to Leslie Mitchell to comment, etc., on a fashion parade of furs. With his whole brief in his hand, the girls came on wearing gorgeous furs which he described with meticulous accuracy. Unfortunately, on the second round, the mannequins hadn't time to change and got out of order. Thus Leslie found himself describing mink as fox, chinchilla as sable, skunk as ermine, and so on. He had undoubtedly convulsed female viewers everywhere."

So, evergreen, " Picture Page " goes on. It is now produced by S. E. Reynolds, who is an old enough hand to take in his stride the inevitable ups-and-downs, technical imperfections and even the horrors of non-arriving Hollywood celebrities.

Personally, I like the unpredictability of my favourite television programme and I hope very much that perfection of technique will never reach a stage that denies me my chuckle : " Ha, ha ! That one got the Ally Pally boys and girls into a nice how-do-you-do."

After all, we all like laughing with our friends, and " Picture Page " is a really friendly programme.

FRENCH TRANSMISSION

THE new 300-watt transmitter at Lille, recently made some experimental 819 line transmissions. These transmissions are being carried on at intervals on 185.25 mc/s. for vision and 174.5 mc/s for sound, with horizontal polarisation. The station is owned by Radiodiffusion Francaise.

OUTSIDE BROADCASTS

By PETER DIMMOCK

Assistant Head of the B.B.C. Outside Broadcasting (Television)

OUR job in Television Outside Broadcasts, or "O.B.s" as they are colloquially called, is to see that as many as possible of the interesting events which take place within about a 20-mile radius of London are relayed instantaneously to the home viewer by means of one of our mobile O.B. units. We are hoping that as new radio-link equipment arrives it will be possible to extend this area and also to operate occasionally in the vicinity of the Midland television transmitter at Sutton Coldfield. Outside Broadcasts from the Midlands do, however, present rather a problem, because the mobile units require a large maintenance base as a headquarters from which to operate. At present, this is at Wembley, in North London, which means that a Midland O.B. will involve a considerable amount of travelling time, together with the possible loss of two or three outside broadcasts that could have been televised from the London area during the same overall period.

At the present time we have in service three post-war mobile units, each consisting of a control van, a transmitter van, an aerial van, and, if required, a mobile generator. The generator is only required where an adequate mains supply of electricity cannot be obtained either for the control van or any lighting which may be necessary. The mobile transmitter and its associated 90ft. high mobile aerial are used at locations where an underground vision cable link to Alexandra Palace is not available, and the picture is transmitted by radio to Alexandra Palace for retransmission on another wavelength to viewers at home.

In charge of all this technical equipment is Tony Bridgewater and his assistant, W. D. Richardson. Under them senior engineers Newman, Hawkeswood and Hartwright are responsible for the three mobile units. The important maintenance side of O.B.s is supervised by A. J. Bray, while the planning side is in the hands of W. D. Hatcher. These are the men who, together with a large and highly skilled technical staff, ensure that the mobile units are kept "on the road" and able to transmit good quality pictures whatever the conditions out on location.

On the programme side there is S. J. de Lotbiniere, head of all B.B.C. outside broadcasting, and myself as his chief lieutenant responsible for television O.B.s, together with six producers. Keith Rogers, Alan Chivers and Aubrey Singer specialise in producing documentary O.B.s such as the popular "Other People's Jobs" series. Michael Henderson, Barrie Edgar, Berkeley Smith and myself concentrate, in the main, on actuality outside broadcasts, such as royal and public events, sports programmes, etc. Our aim, however, is to work as an interchangeable team, so that one producer is just as likely to find himself presenting one type of O.B. as another.

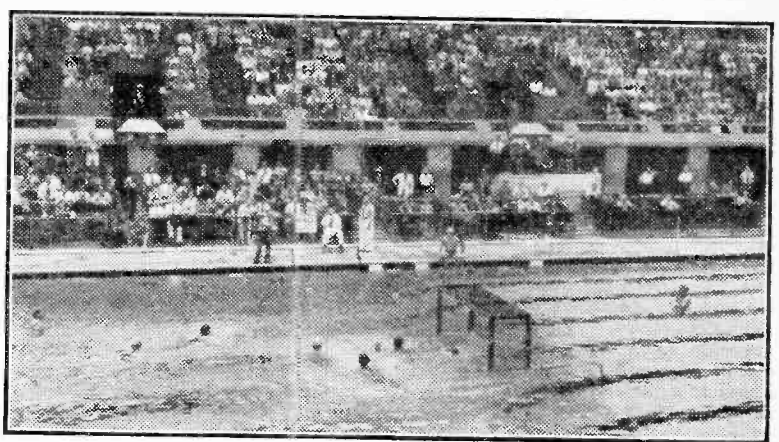
Problems

The problems in television O.B.s are, of course, very different from those in ordinary sound broadcasting. There is the added complexity of matching both sound and picture, together with difficulties such as lighting, camera angles, positions and movements. Instead of the comparatively simple equipment used on a sound O.B. television requires about 60 times as much, and weighing anything up to 350 cwts.

On the average the number of O.B. programmes per month varies between 18 and 21, and the majority of them are planned a long, long time before the broadcast. Records are kept of all the main public and sporting events suitable for television, while constant research and investigation is carried out on possible documentary sources which might provide interesting programmes.

Preliminary O.B. schedules are made out four months ahead, and each week a television programme planning meeting is held by Cecil McGivern, head of television programmes, at Alexandra Palace, to determine which events shall be televised direct by the mobile units; in some cases, when a unit is not available or where the event is outside the O.B. operational radius, television newsreel covers it instead.

The finalising of details for a television outside broadcast is a complicated business. First of all, an O.B. producer is put in charge of the programme, and it then becomes his responsibility to make all the detailed and varied arrangements. His first task, in conjunction with an O.B. planning engineer, is to arrange for a meeting at the proposed site of the O.B. to settle such details as camera positions, parking space for the mobile unit, the routing of the various camera cables, micro-



One of the most successful of the Tv outside broadcasts was the Olympic Games. Here is a scene in the great Wembley Pool in the polo match between Italy and Hungary

phone and telephone leads. If the site of the outside broadcast is near a cable route, the vision and sound signals both go through this channel, but otherwise the sound is transmitted through G.P.O. landline and the vision by radio from the mobile transmitter and aerial. When these facts have been settled, all other interested parties, such as the electricity supply authority, the police—to advise on parking arrangements, and the local County Council—whose task it is to see that the positioning of our cables and equipment do not infringe public safety regulations, are consulted.

With all these preliminary arrangements completed the O.B. producer's next task is to decide on the commentators for the programme. In addition to using many sound broadcasting commentators, such as Richard Dimbleby and Wynford Vaughan Thomas, television has built up its own team of commentators. Many viewers will have heard Peter Wilson's vivid phrases at some of our boxing O.B.s, and he, like many others, has built up a vision commentary technique which adds expert explanation to the picture only when occasion demands. Undoubtedly of paramount importance in the art of television commentary is the ability to resist the temptation to speak continuously. The commentator should avoid, so far as possible, reference to irrelevant events taking place outside the camera's field of vision and statements of the very obvious. Both merely irritate the viewer at home who, in the first instance, automatically wishes to see the object of discussion and, in the second, can clearly see what is taking place without being told.

After writing the " billing " of the programme for the television edition of the " Radio Times," the O.B. producer considers the detailed treatment of the broadcast. He prepares a " shooting " script which will include opening and closing announcements, camera and microphone movements, and the commentator's special cue lines. All vision instructions, such as camera mixes and alterations in lens sizes, appear on the left-hand side of the script, while all the sound instructions and cue lines go on the right. The script is then duplicated and issued to everyone connected with the O.B.

An Early Start

The mobile unit usually moves into position the day before the broadcast, and as soon as the cameras and equipment are installed and working, the O.B. producer, together with the senior engineer in charge of the unit, will select the lenses, camera turrets and size of tube to be used. The question of lenses is a complicated one, as each camera is equipped with either three or four lenses, each of a different focal length and mounted on a turret which can be swung manually by the cameraman. With a selection of lenses varying from 1.5in. to 20in. in focal length, there is a wide choice of different angles of view varying from long-shot to close-up. In this connection, however, it must be remembered that telephoto lenses which give narrow-angle long-distance close-ups usually require a well-lit subject and are, therefore, more dependent on good weather.

The latest development in television camera lenses is known as " Zoom," which is a manually operated apparatus that enables the cameraman to vary the lens angle at will and obtain a change of focal length at a ratio of 2 : 1. The skilful use of " Zoom " on a sporting event can often make the viewer feel so much part of the game that he imagines that he is on the field of play itself and about to score the winning goal.

The nerve centre of the mobile unit is the control van from which emanate the cables to the three television cameras. In this van work the O.B. producer and the specialised engineers controlling the complicated technical equipment. A short while before the O.B. transmission is due to begin, the O.B. producer takes up his position at a table in the control van from which he will direct the programme. On either side of him sit the senior engineer and sound mixer, while in front of him sits the vision mixer at the master control panel. Stretched in front of them are four monitoring screens, one displays the picture actually being transmitted and, therefore, corresponds to one of the other three screens, each of which represents a camera channel. There is also a fifth screen which provides a check radio picture so that the producer and engineers can see the programme being transmitted from Alexandra Palace. The camera operators and commentators all wear headphones through which they receive instructions from the producer. At the back of each camera there is a small microphone which enables the cameramen to speak to the engineers in the van controlling the electronic equipment.

Each camera is numbered so that on transmission the O.B. producer can quickly direct the cameraman on to any particular scene that is required. He can either cut (change instantaneously) or mix (change slowly) from one picture to another. The preview screens give him an opportunity to select which camera he intends to use next and also a chance to compose that picture in relation to the shot already being transmitted. In this way the continuity of action can be preserved.

Finally, the commentator's words, " and so we now return you to Alexandra Palace," mean the end of the O.B. so far as viewers are concerned—but not for the men behind the scenes. The teams of riggers and engineers will begin to dismantle the equipment and store the various cables in the vans. If the mobile unit is due to undertake a further O.B. within the next 48 hours, then it moves at once to its new location, but otherwise it returns to its base at Wembley for maintenance. The O.B. producer returns to his office and, with his secretary, makes out a full report of the outside broadcast as televised before getting down to his next assignment.

There is no doubt that television is playing and will continue to play an important part in sporting and public events. It will do even more to stimulate and keep alive interest in all the varied activities which go to make up our national life. In the sphere of sport, for example, many viewers will, through the medium of television outside broadcasts, be introduced to some games the appeal of which they might otherwise never have known. In fact, they are very likely to become fans from then on and take advantage of the first possible opportunity to watch the sport in reality.

WANTED MEN TO BE TELEVISED

AGREEMENT has been reached regarding the use of the television transmitter as an aid to Scotland Yard in broadcasting the pictures of wanted people. The pictures will be supplied by the Criminal Records Office and may be shown both in full face and profile. It is stated that this use of television will only be made in special circumstances and will concern people who are urgently wanted. It will be recalled that when radio was first used by the police it resulted in the arrest of the murderer Crippen and his accomplice Ethel Le Neve, who were detained on their way to America as a result of a radio description of them which was received on the ship's radio.

Building the "Viewmaster"—3

An Amateur Describes his Experiences in Building this Popular Home-constructor Set

By ALAN CHISHOLM

THE receiver is now ready for the fitting of the valves and C.R.T. The valves I am using are Cossor and Mazda and the tube is a Mazda CRM 121 (12in.). Valves 1, 2, 3, 5 and 6 are Cossor 63 SPT's, valve 4 is a Cossor 6AL5 and valve 7, Cossor OM4. Mazda 6P25's are fitted into valveholders 8 and 12, Mazda 6K25's into holders 9 and 11, and a Mazda 6P28 into holder 10. The Cossor valves 63 SPT are metal shrouded with small pins and special care is necessary to see that they are fully inserted into the holders which may prove to be somewhat stiff. If necessary, slightly open out the spring ring on the underside of each holder as this is intended to grip the annular groove round the valve stem. Valve 4 also requires care in fitting. Should the pins appear bent they may be straightened by gripping them in small nosed pliers, *without holding the glass envelope*, exactly as one would straighten a bar in the jaws of a vice. I prefer this method to that of easing out the valve holder sockets as if they are opened out too far there is a risk of a bad connection or open circuit.

You cannot be too careful when fitting the cathode ray tube. To fit the rubber mask sit down and hold the tube between the thighs, neck downwards of course. Gently ease the mask over the rim making sure that it extends evenly all round over the edge, and remember to position it so that the E.H.T. terminal is in the approximately correct position for connecting up. Get someone to hold the scanning coils in position, push the neck of the tube through them and then through the felt protected hole in the rear support and locate the front edge in the cradle support. Fit the rubber band to secure the C.R.T. in position. Make the top connections to Valves 7 and 10 and connect the E.H.T. lead to the C.R.T., then fit the fuses and the neon lamp.

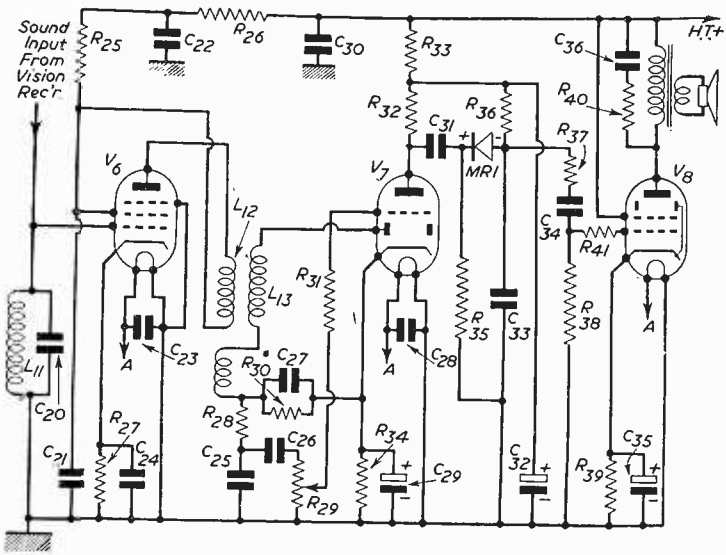
Aerials

The type of aerial that you employ is a matter that you have to decide having regard to all the local conditions for reception, such as distance from Alexandra Palace or Sutton Coldfield as the case may be, and possible sources of interference, etc., but the article on the choice of television aerials in the "Viewmaster" book should prove of considerable help in making your decision. If, however, you are in any doubt, have a talk with other viewers in your area, or better still consult your local dealer from whom you will buy the aerial. Use an indoor aerial if at all possible as it is less subject to interference. My own "Viewmaster" is working perfectly from a "V" aerial in the loft, but I am only eight miles from Alexandra Palace.

To make a neat job of installing the Belling and Lee twin feeder cable, I decided to bring it straight down through a cupboard by the fireplace in an upper room, through the upper floor and ceiling of the ground floor to the set. This can be done quite simply without taking up the floor, in the following manner. Heat the end of an 18in. length of ¼in. round mild steel until it is red hot and hammer it flat, then file it into a diamond bit, exactly as the small drills one sees in a fretwork set for use with an archimedean drill. Put a small saw cut in the lower end of the rod at an angle sloping towards the end.

The joists between the upper and lower floors are usually between 7in. and 11in. in depth. You must, of course, miss these. You can find a clear position by using a small bradawl or drill which will go through with a rush after passing through the plaster-board or lath and plaster ceiling if you are clear of a joist. Using your home-made bit in a brace you can then drill right through the ceiling past the joists and through the floor above. Release the drill from the chuck but leave it projecting into both upper and lower rooms. Cut back the insulation on the feeder cable, make a loop of the two wires and hook it into the slot on the drill. The cable can then be drawn through into the room above and the procedure repeated for getting it into the roof. Even if you decide on an outdoor aerial you can probably adopt this method as it is normally easy to find an outlet from the loft to the roof or chimney stack, and chances of picking up interference are reduced. At the receiver end allow sufficient cable to get all round the set to carry out the adjustments necessary.

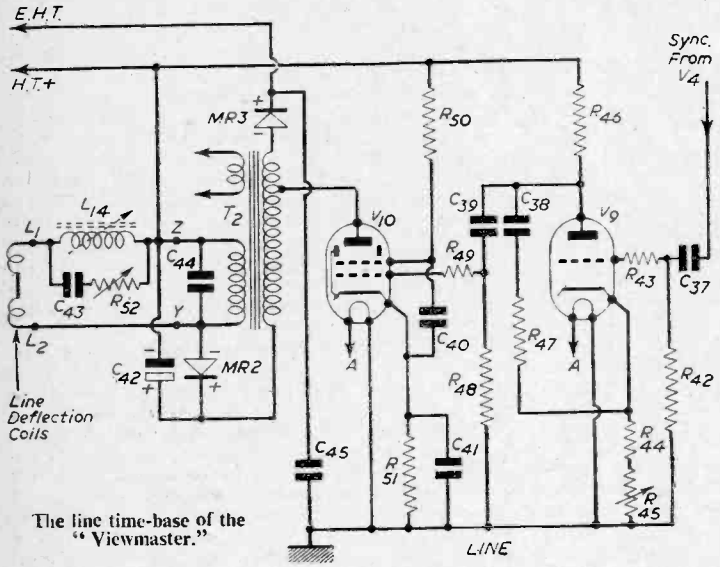
A water pipe provides the



The sound section of the "Viewmaster."

best earth, so make a connection to one if at all possible.

This leaves the mains lead only to be connected. See that the receiver switch is in the "off" position. Pay special attention to the instruction concerning the neon lamp. It is the safeguard provided by the designer against the possible risk of shock. I strongly advise the use of a three-pin plug and socket for the mains connection, not because of the earthing socket, which is not, incidentally, used, but because once you have made the correct connection, the receiver may be disconnected and re-connected as often as necessary, without any further re-checking. Once having connected the lead at the plug and receiver, switch on. If the neon lamp does *not* light, do not immediately accept this as proof of correct connection, as other reasons could prevent it lighting, but disconnect at the receiver, turn the socket round and re-connect. If the lamp lights your mains connection is O.K., but don't forget to reverse the socket to its original position. If the lamp still does not light you must check as indicated under "Power Supply" on page 32 of the "V.M." book.



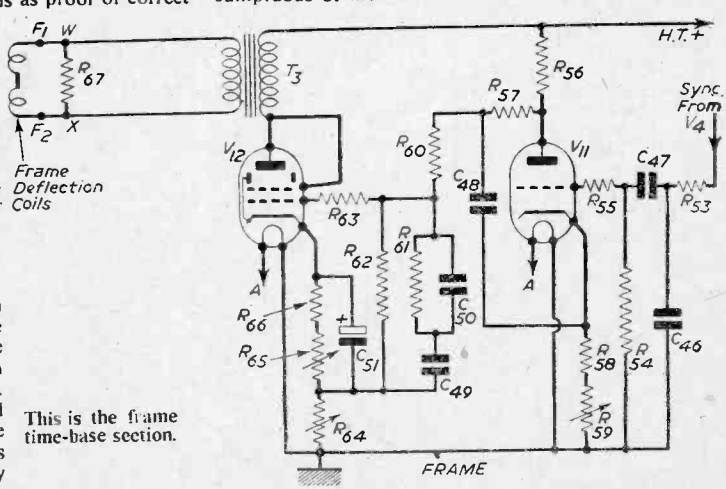
The line time-base of the "Viewmaster."

Testing

When all is in order, switch on and allow a few minutes to elapse before slowly turning up the brightness control (third knob from the left) until a raster is visible. This is seen as closely spaced horizontal black lines with some white lines running downwards from right to left. This raster may not be centred, sharply defined, steady or horizontal and the sloping white line may run from left to right. The raster is brought into sharp definition and position by adjustment of the three screws on the focus coil. First of all approximately position the raster so that it completely fills the screen with no blank spaces on any edge. Then screw in the adjusting screws a half turn at a time until the black lines are clearly defined. If the raster tends to move off the screen you must find by trial and error the screws which require extra adjustment for re-positioning. Do not have the brightness control turned up more than is necessary to see the lines, as over brightness destroys definition. The raster is steadied by adjustment of the frame and line locking controls at the back of the set. If the raster is not horizontal, slowly rotate the scanning coils round the neck of the C.R.T. *taking care not to touch the E.H.T. terminal.* Should the white lines slope from left to right, you must withdraw the C.R.T. (after switching off, off course), reverse the scanning coils by turning them end-over-end, and replace the tube.

Once having correctly focussed and positioned the raster, the set is ready for aligning. Make up a small screwdriver from fibre or hard wood sufficiently small in diameter to pass down into the coil formers and about 3in. long. Lay out Chart 4 for reference so that you can quickly identify each coil by number.

I have heard of instances in which sound and vision have been obtained with very little adjustment, but in my own case, I was not so lucky and spent some little time before meeting with success, so do not be discouraged if nothing is heard or seen after making initial adjustments as instructed in the "V.M." book. Aligning is not difficult, but requires patience. It would be presumptuous of me to endeavour to improve the instructions of the designer on alignment contained in the book, but I would add that although the commencing point for adjustment of the cores is stated as level with the tops of the formers, it may be that the correct



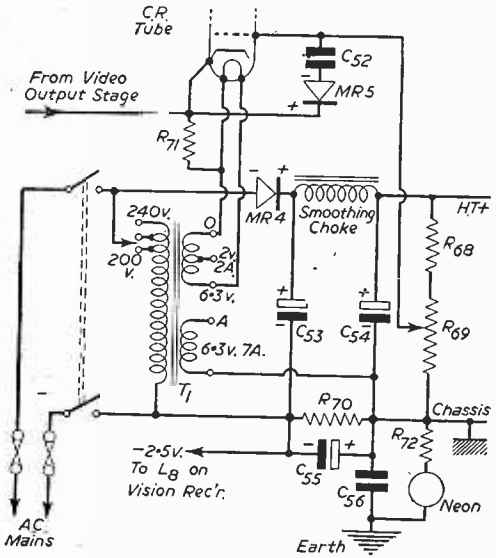
This is the frame time-base section.

alignment position will be found in some cases, with the cores projecting some ¼in. above the tops of the formers as with three coils in my set.

Once having aligned the receiver, do not forget to seal the cores with wax, unless you decide to have it checked on a signal generator.

Cabinet

The Tallon cabinet consists of seven walnut veneered sections ; the two sides, top, screen front, control panel,



The power unit and tube supply.

one piece 4¼in. deep and one 2¼in. deep, the latter having a walnut fillet on one edge. In addition there are the speaker fret, two side supports, two cross bearers on which the receiver rests, the bottom and three hardboard sections for the back. An armoured glass panel and castors can also be supplied.

Commandeer the kitchen table (it is much easier to work at this height than on the floor) and cover it with the domestic ironing blanket to protect the cabinet from damage. Lay one side on the table, polished side down. Slide the tongue of the top section into the groove in the top edge of the screen front and press firmly together and place into position on the side, taking care not to move the top and screen panel in relation to each other or the tongue may be split. With a small bradawl mark the position of each screw through the screw holes. Carefully remove top and screen panel and enlarge and deepen each marked point with the bradawl. Position the 2¼in. deep section immediately below the polished stop piece already on the side, with the hardwood edge towards the top, then the speaker fret and finally the 4¼in. deep section. If the table is level they will stand without support. Mark each screw hole, remove the section and deepen and enlarge the holes as before. Do exactly the same for the other side. By adopting this method it will be easier to drive home the screws which being close to the side, do not leave a lot of room for the manipulation of a screwdriver.

It is worth while to glue the edges of the sections before screwing down, but remember not to glue the speaker fret as it may be necessary at a later time to renew the silk should it become damaged. Leave the control panel for the moment. Position and screw in the bottom of the cabinet with the reinforcing blocks underneath. To find the position of the side supports for the cross bearers place the receiver on a table and measure the distance from the table to the bottom edge of the mask. The mask fits snugly into the recess made by the fillets by which the armour glass is held. With the cabinet lying on one side, mark off from the inner edge of the bottom fillet the point to which the bottom of the receiver will extend. Scribe a line at right angles across the cabinet ½in. below this point to allow for the thickness of the cross bearers.

This is the position of the top edge of the side supports. Treat each side alike and screw home the side supports at front and back only. Fix one cross bearer at the back and the other about 3in. from the front. Now try the receiver for position. If the mask does not lie flush with the glass, the side supports must be adjusted, the *backs* being lowered if the bottom edge of the mask is not touching the glass, or raised if there is a gap at the top edge. As an indication of the amount of adjustment required, a gap at the bottom edge of the mask of ¼in. in my receiver was corrected by dropping the back of the side supports by ½in. When adjusted screw in the middle screw of each support. To correctly position the control panel, measure off the distance from the bottom of the receiver to the centre of the control spindles, add ½in. and mark off the total distance towards the top of the cabinet, from the line already scribed across each side. The holes in the control panel can then be lined up with that mark and the panel fixed by screws. Extension collars and spindles are, of course, necessary. Do not forget to secure the receiver by making four little wooden clamps, held down by screws, over the bottom framework of the receiver. Cut the necessary holes in the main back panel for the aerial, earth and power leads and then screw on the three sections.

Your receiver is now complete and in performance and appearance you will have a set of which you can justly be proud.

CLUB Reports

MEMBERS and their friends assembled in very large numbers at the monthly meeting of the British Television Viewers' Society, held at Kennard's Restaurant, Croydon, on April 24th. The occasion was the eagerly-awaited visit, as guest speaker, of Mr. Leslie Mitchell, of film, stage, radio and television fame. Mr. Mitchell, in the course of a most interesting talk, spoke on his experiences in the early days of television. As interviewer for a very considerable time in the weekly television feature, " Picture Page," he is, perhaps, best known to viewers and those present at the meeting were given the opportunity of personally speaking with Mr. Mitchell. That his work, both on television and in other spheres of entertainment, is greatly appreciated was evidenced by the very sincere and hearty vote of thanks accorded him by one of the society's members, after questions had been put to and replied to by Mr. Mitchell.

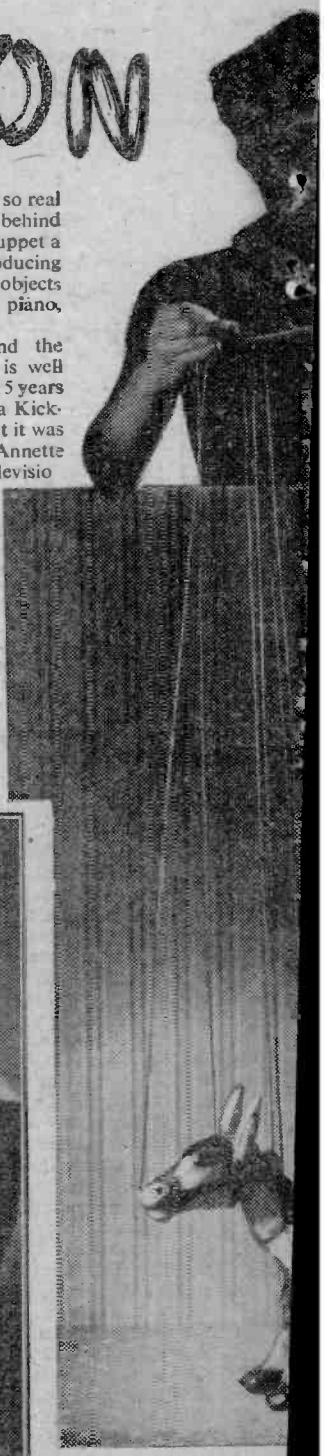
TELEVISION

BY JAN BUSSEL of

A NEW chapter is opening in the history of English puppetry, a chapter in which television is playing a vital part. In the new approach the puppet master is no longer regarded as a vagrant showman, but as a creative artist—as indeed he is, and has been recognised as such for many years on the Continent, where nearly every big city boasts at least one permanent puppet theatre as part of its cultural life, and finely sculpted figures are to be found in the museums and art galleries. The artistry, however, does not lie solely in the carving of puppets, but in their direction. As a producer of television plays, actors sometimes taunted me with the suggestion that I preferred working with puppets. This was quite true. When casting how else can a director find such exact materialisation of his fancy as in the specially created puppet? Where else can he find such a patient and obedient company to rehearse? In performance where such freedom from temperament and human frailty? Or, from an actor's point of view, how better can one express oneself than through one's puppets? No need for make-up and false beards to simulate the desired character. The character himself stands on the stage below. One has but to speak and pull the strings to bring him to life. No other theatrical form can offer such freedom to the artist's imagination, nor such overall control. When the puppet theatre is given the unlimited canvas of the television screen the possibilities are enormous. The camera perhaps loses the charming fantasy of the "quaint little people," who seem so real in their own Lilliputian world behind the footlights, but it brings the puppet a concrete realism of its own, introducing him in close-up amongst every day objects —Muffin the Mule on the grand piano, for example.

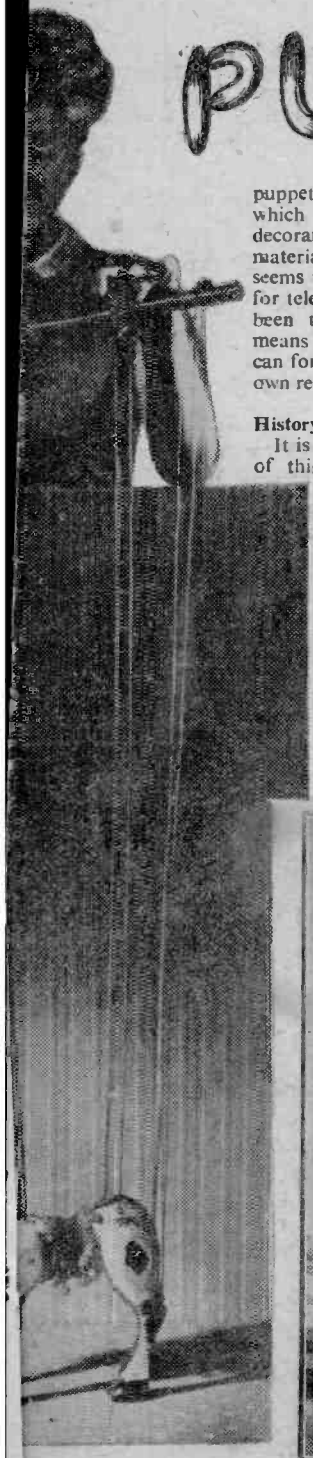
The power of television, and the different approach it demands, is well illustrated by Muffin: for nearly 15 years he performed very amusingly as a Kicking Mule in our puppet circus, but it was not until we introduced him on Annette Mills's piano in front of the televisio cameras that he began to achieve fame.

Muffin, of course, is a string puppet or "marionette." There are several other kinds—glove puppets, similar to Punch and Judy, rod puppets, shadow puppets. All have been used with success in television. Glove puppets in particular have proved very popular. The Little Grey Rabbit series which Ann Hogarth has dramatised from Alison Uttley's stories are regular favourites. Shadow



PUPPETS . . .

the HOGARTH PUPPETS



puppetry, a fascinating oriental art in which the coloured shadows of figures decoratively cut from semi-transparent materials are played upon a screen, seems to me to offer even greater scope for television, but so far this form has been the least developed. Here is a means by which the too truthful camera can for once follow the puppet into its own realm of dreams and imagination.

History

It is exciting to contemplate the union of this very old art with the newest medium. For puppetry is so ancient that no one can give its origin. It appears in all the early civilisations and is in one form or another the earliest known theatre, often springing from religious rites. Shadow puppets are probably the oldest of all. Even to-day the traditional dancing and acting of the East deliberately copy these puppets' movements; whilst Sutradhara, an Indian word for theatrical producer, can be translated literally as "string puller."

Puppets arrived in England comparatively recently, in the sixteenth century, when Italian showmen performed in booths in the streets of London. They realised their height in Puritan times when the human theatre was taboo and players, artists and writers turned to the puppet theatre as their only outlet. Elaborate performances were staged, including Shakespeare and opera and such spectacles as "The Great Flood" or "The Fall of Sodom and Gomorrah." The travelling puppet shows followed, touring our village greens like the circus with their big tent theatres. But these, though a few lingered on and are still within living memory, are now all gone.

Designing puppets for television is a technique on its own. Colouring of costumes and the painting of the puppet must be gone into very carefully, for the cameras have their own special likes and dislikes in this matter. The carving of the puppet faces should be made to respond best to top lighting, for with all the apparatus on the studio floor there is little room for lighting at the puppet's own level. For figures which are to be seen in long shot a bold theatrical treatment is good. But for close-up work a much subtler finish is needed. The manipulation must also be adjusted for the distance away of the camera.

Cutting from one camera position to another affords an opportunity to duplicate figures. An extra large head-and-shoulder puppet with moving mouth and eyes may be used for close-up work in conjunction with a

smaller more broadly carved replica of the same character for long shots. For whereas in the theatre smallness is one of the puppet's essential characteristics, in television there is no need to give away your scale. The puppets may, in actual fact, be any size ; to the viewer they may appear as giants or midgets as the director wishes, solely by means of the properties and scenery he shows with them. A change of size is not apparent, provided the setting does not reveal it, but merely suggests that the camera has moved farther or nearer. The television close-up which does not magnify as in film, but brings the viewer within arm's length of the subject, offers something quite new in puppetry and is extremely important. A delicacy of manipulation is called for that requires the greatest skill and can be astonishingly effective. The greatest delicacy is also needed on the part of the cameraman, to hold the focus. The normal distance of a camera for a close shot of a human face is still a full-length long shot for a puppet, and this is difficult enough ; when taking a puppet close-up the depth of focus is reduced to something less than half an inch !

Presentation

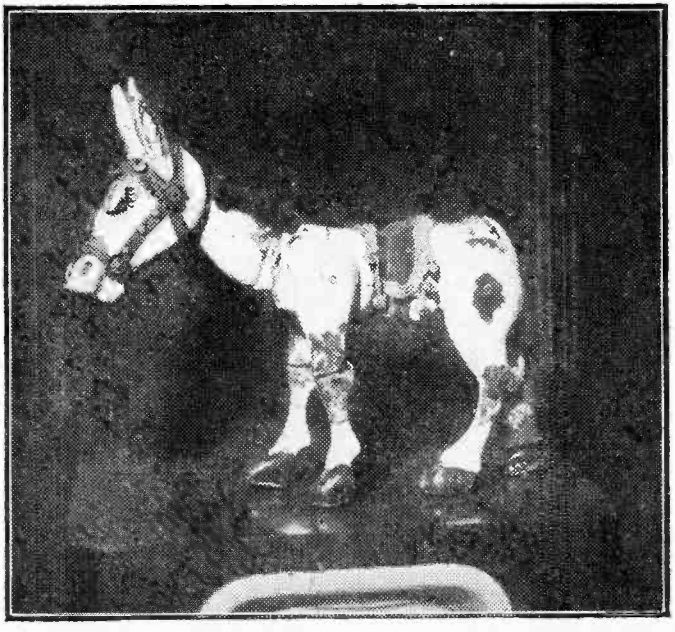
It is, however, more in the presentation than in the construction of puppets that television has opened up new avenues. To begin with the whole conception of "a little theatre" is superfluous. The décors are placed around the studio with bridges for the operators wherever required. A proscenium is not only limiting in space, but hinders the strong lighting necessary. The viewing screen replaces the proscenium. It is possible by using a number of cameras to fade from scene to scene without a break ; or alternatively to use one long continuous scene along which the camera can wander. The setting we use for the Little Grey Rabbit glove puppets is 30 ft. long. The camera shows just that part of the scene required and characters who presumably continue their existence in their various little houses in this wide landscape can be forgotten about after the camera has travelled past them—a form of presentation which would be quite impossible before an audience in a theatre. Nevertheless, neither this huge panoramic effect nor multiplicity of puppet scenery takes up undue space in the studio.

Even in cases where it is desirable to give the impression of an actual puppet theatre with its own curtain and footlights many settings are possible. In our production of the operetta "Red Riding Hood" we used two duplicate theatre fronts : while a scene was in progress in one a new scene could be prepared in the other. In this show we also tried the experiment of mixing glove puppets and marionettes. Thus the Wolf and the Rabbit were gloves, Red Riding Hood, Grannie and the Foresters, marionettes. Further, a string puppet of Grannie in bed was duplicated by a glove puppet Grannie underneath the bed. This mixture of techniques involved channels specially cut in the stage floor to suit the puppets' movements for each different scene. It also meant raising the marionette stages six feet from the ground to make room for the glove operators below. A puppet orchestra appeared on a third stage : again a presentation impossible to give in a theatre. The Muffin programmes are also difficult to stage before an audience. For apart from the problem of hiding Ann Hogarth manipulating the puppets on the grand piano, a job the camera does with no difficulty by simply not looking at her, there is the danger that the presence of a human being—even one as charming as Annette Mills, who sings and interprets for them—may dwarf the puppets in size. In television, of course, the camera is never very far back, and can move in at crucial moments to enable a puppet to fill the screen.

The mixture of the human scale with puppets, often fatal on the stage, is very successful on television, and I have used it on several occasions. At one time I presented a series of Puppet Picture Page programmes, in which a Puppet Joan Gilbert interviewed sometimes other puppets, sometimes their manipulators, and on one occasion Joan herself. Then there was a Christmas show when I made all the Christmas-tree toys come to life and jump into the human Father Christmas's sack ; or the fantasy when two puppet children went to sleep in the nursery and the camera switched to a life-size replica of their window to see the fairies fly in and dance on the chest of drawers.

Apart from these new fields of artistic exploration, television has something else to offer puppetry : money ! For the first time puppets are able to show to an audience large enough to make it economically possible to employ many operators and even a full orchestra. In one production I was able to call upon the services of twenty operators from eight different companies, who pooled resources in staging a "communal" underwater ballet. After listing the puppets available I was able to plan the ballet from the most astonishing cast ever assembled :

Four octopuses.	One dozen angel fish.
Two sea urchins.	One Neptune in chariot.
Four Swordfish.	Six oysters . . . and many others.



The most popular puppet figure—Muffin the Mule.

Servicing Television Receivers—3

How to Locate Faults and Cure them in Commercial and Home-made Equipment

By W. J. DELANEY (G2FMY)

THE faults which have so far been described are what might be termed "complete breakdowns," that is, those which cause a complete cessation of either vision, sound or scan. Unfortunately, this type of trouble is the least common, and the majority of faults which are experienced are those which might be termed "partial breakdowns." Such a very wide field is covered that it is obviously impossible to deal with every type, but a general review will give an indication of the cause of such troubles and the lines of attack in looking for the actual faulty part. As an indication of the type of trouble referred to we may mention the slipping of a picture; the tearing of the lines resulting in a jagged picture throughout its depth; a picture which is satisfactory on the right-hand side but which is closed up on the left into a very narrow strip, making all objects very thin. These are extremely common faults and it is this sort of trouble which is generally experienced.

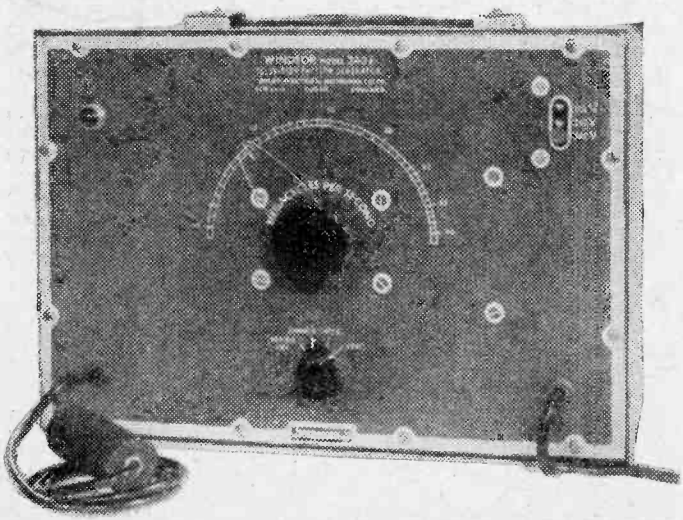
Picture Quality

The first topic to be covered, therefore, is that of picture quality. As is well known the various circuits of a television receiver must be accurately tuned for several reasons. First, to obtain correct light, shade and detail in the picture, a definite bandwidth must be received. Satisfactory pictures may be obtained with a bandwidth of only just over 2 Mc/s, but for best results a band of at least 2.75 Mc/s should be obtained, and the home-constructor of a television receiver should not be satisfied with less than 3 Mc/s. This band of acceptance must, however, bear a definite relationship to the frequency of the received station. If double sideband reception is employed, the band should extend equally on each side of the exact frequency, whilst if single sideband it must have a definite position above or below the frequency. If the acceptance band is low the lower frequencies will be unduly accentuated, whilst if the band is high, then the high frequencies will receive undue prominence. (These statements ignore, of course, H.F. cutting or accentuation due to special circuits.) If the lower frequencies are over amplified the result on the picture is a smearing or smudging to the right of dark tones. On the test card C, for instance, the black rectangle at the top will have a dark patch to its right, fading away over half an inch or more. It should be mentioned here that a very slight smudge will probably be unavoidable and is due to defects in the actual transmitter, but it should be only of the lightest grey and hardly noticeable.

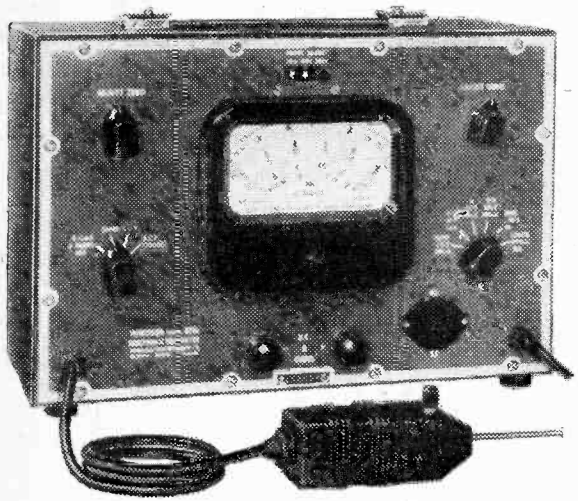
Excessive H.F. Response

If the H.F. is over-emphasised the general result is to develop a white outline round the right-hand edge of a black object, or a black line round a white object. These outlines can vary according to whether the grid or cathode of the tube is modulated, and to whether the output to the tube is taken from the anode or the cathode of the video stage. Therefore, if any form of outlining is seen to the right of objects in the received picture, the most likely cause is excessive high-frequency response. Some circuits are provided with tuned or resonant chokes, between the demodulator and the video stage, or between the video anode and the tube, and if these are resonant at too high a point (due to being home-made and not correctly wound), a change in these, or a short-circuit across them to cut them out, will show whether they are the cause of the trouble. If the receiver is a single sideband model, using the upper sideband for the London station, one or more of the circuits are probably tuned to 48 or 49 Mc/s. If this has been carried out without a signal generator a reduction in the frequency should be made (screw core *into* the coil if it is iron, and screw *out* if of brass or copper). A little care may have to be taken here to distinguish between this type of outlining and that produced by a "ghost" or echo. These are caused by the oncoming signal wave striking some object beyond the aerial and being reflected back to the aerial. As a result a second picture follows the first with a slight time lag, the distance between the main picture and the fainter echo giving an indication of the distance away of the reflecting object. If the latter is very close to the aerial, the space between the two images will be so small that the effect will be that of an outline to the image similar to that given by the defective H.F. response.

An insufficiently wide band of acceptance will give a weak picture similar to that obtained when the contrast



For accurate adjustments of a modern television receiver a pattern generator such as this Windsor model is invaluable. It checks raster linearity, vision receiver frequency and bandwidth, sound channel frequency, frame frequency and linearity.



Another valuable test instrument. The Windsor electronic testmeter.

control is turned down too far, and this fault, together with those just mentioned can all be caused as a result of vibration. A loudspeaker operated at too high a level may shake the chassis and the cores may rotate slightly. Some designers recommend the sealing of the cores with wax, but the contraction of the hot wax on cooling tends to shift the cores and I prefer the use of rubber string. Simply cut a thin rubber band (made of square-section rubber) into two, and thread a length through the coil former before putting in the core. This will be found to hold the core against even very strong vibration.

Insufficient gain in the vision amplifier is, of course, a fault in design for the particular locality, and is hardly a fault which will arise in an existing or already working receiver. Failure of the components in any stage will in most cases result in a failure of that stage, consequently the signal will be cut off from the succeeding stages and the picture will vanish. A faulty coupling condenser may result in a reduction of signal strength, or, due to a positive bias being applied to the succeeding grid, will cut off the signal. Thus stage-by-stage testing as in ordinary radio practice should enable faults of this nature to be traced.

Sync Faults

Two other types of picture fault may be mentioned here, although they are not necessarily due to faults in the actual vision receiver. Dark bands passing across the picture vertically, with a breaking up of the picture in time or step with speech or music being received will readily be identified as sound break through, which again is obviously due to a tuned circuit having varied to bring in some of the upper part of the sound signal. Any vision circuit, therefore, which is tuned below 45 Mc/s in the case of the London area, and those tuned to the lowest frequency in the case of the Midland area should be raised slightly. A similar breaking up can also be caused by faulty synchronisation. This can easily be distinguished, however, by the fact that, generally, the upper part of the picture only is broken up continuously, whilst when horizontal displacement occurs somewhere lower in the picture it will usually be seen that it coincides with some white object on the right-hand edge of the picture. The breaks will be seen to be moving quite independently of the " rhythm " of the sound signals.

(To be continued)

Standard Tuning Signal

THE standard tuning signal which is radiated before every programme, and which is reproduced below, is a valuable guide to receiver adjustment. The linearity adjustments should enable the ring surrounding the clock to be made a true circle, and the two blocks of tones at each side of the clock should be of equal width. The diced border should have all black and white segments equal, and the width and height controls should be set so that the border comes just inside the edges of the mask. Strictly, there should be no white circle round the right-hand edge of the clock circle, but a slight surround would not be objectionable and would help to sharpen up the images. This is known as " black after white." To the right of the lower black lines in the two tone sectors there should be no dark smudge—this indicating excessive low-frequency response or phase distortion as described in the article above. The ruled lines in the centre of the clock should be clean and distinct and easily counted—without false whites due to black after white. The hands of the clock should not be kinked where they cross the ring surrounding the inner section of the clock.

Brilliancy and contrast controls should be set so that the four tones are as shown in this reproduction. Generally speaking, the contrast control will govern the two upper shades, and the brilliancy control the lower shades.

Standard Radio Components Recommended for the Electronic Engineering Televisor

BOOKS. Midland Edition, including wiring diagrams, 5/3. **CHASSIS.** Vision chassis fitted with valveholders and coil-formers, 23/6. Sound chassis fitted with valveholders and coilformers, 20/-. Time base chassis fitted with valveholders, 18/9. Power Pack chassis with valveholders, 26/-. **SMOOTHING CHOKES.** Varley DP62 10H, 80ma. 190 ohms, 18/-. DP52. 5H. 250ma. 50 ohms, 20/-. **FOCUS COILS.** A.M.C., 34/-. Elac P.M. focus rings. R20 (for triode 9in. tube), 23/6. R17 (for tetrode 9in. tube), 22/6. R25 (for 12in. tube), 26/6. **COILS.** London (with heater chokes), 17/3. London (less chokes), 14/3. Midland (with chokes), 19/3. Midland (less chokes), 17/3. **GANTRIES.** Set of Gantries, front strip and brackets. A.M.C., 10/-. **LINE OUTPUT TRANSFORMERS.** A.M.C. potted type, 33/6. **MASKS.** Cream, 9in., 13/3; 12in., 22/-. **PLUGS & SOCKETS.** Bulgin 3-pin Mains plug and socket, 1/3, 4/9. Belling-Lee Single plugs, L1021, 7½d. 3-pin, L1107, 2/6. Co-axial plug, L642P, 1/6. Socket, L604S, 1/6. 5-way chassis plug socket, L530/1, 5/3. **SCANNING COILS.** A.M.C., 34/-. **TERMINAL BLOCKS.** Grelco 5-way, 3/3. **TRANSFORMERS.** Varley WS903 4,000v. A.C. 2-volt L.T. hermetically sealed and vacuum filled, 69/-. Varley WS903/5. 5,000v. A.C. 2 and 4 volts L.T., 74/-. Stewart 4K5. 4kV A.C. with 2-4-6v. tappings, 64/6. 5kV, 5kV. A.C. with 2-4v tappings, 76/6. Varley EP63, 350-0-350v. 250ma. 6.3v. at 6a, 0-2-6v. at 2a, 4v. at 8a, 4v. at 3a, 91/6. Stewart PT/1. Specification as Varley EP63, 91/6. **TUBE MOUNTINGS.** Wooden Tube Mount for 9in. tube, 13/-. For 12in. tube, 16/6. **HIGH VOLTAGE CONDENSERS** T.C.C. Visconol 0.1 mfd 7 kvw. CP58QO. 15/9. 0.01 mfd, 6kV, CP56QO. 8/3. 0.001 mfd, 12.5 kvw, CP56VO, 8/3. **SUNDRIES.** EF50 Retaining Rings, 1/3. EF50 Ceramic valveholders, 1/3. EF50 Valves (ex-Government), boxed, 12/- each. **RESISTORS.** Morganite, ½ w, type "T." ±10%, 6d.; ±20%, 4½d. each. 1 w. type "R." ±20%, 6d. Erie, ½ w, type 8, ± 5%, 8d. each. Erie, 2 w, type 1. ±20%, 1/-. ±10%, 1/6 each. Welwyn. Vitreous. 4, 6 and 12 w types, 3/8 each. **COLVERN POTENTIOMETERS.** Type CLR/4089/22. 6/-. CLR/4089/15S (2,000 ohm), 6/-. **MORGANITE POTENTIOMETERS.** Type "Q," 5/3 each. **VALVES.** Mullard EF50 (10 required), 21/4 each. Mullard EA50 (two required), 12/10 each. Mullard EBC33 (one required), 11/7. Mazda T41 (two required), 19/10 Mazda PEN46 (one required). 18/3. Mazda PEN45 (one required), 12/10. Mullard HVR2A (one required), 24/4. Mazda UU8 (one required), 18/3. Mullard EL33 (one required), 12/10. **CATHODE RAY TUBES. Mazda CRM92** (triode with 9in. screen and fluorescent Blue-White bulb), £11/6/10 plus 5/- carriage. Mazda CRM121 (triode with 12in. screen and fluorescent Blue-White bulb), £15/2/5. **MULLARD** MW22-14C (tetrode 9in. screen, fluorescent White bulb), £11/6/10 plus 5/- carr.

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Speeding Up Tube Production

Details of a New Machine for Mass Producing Picture Tubes

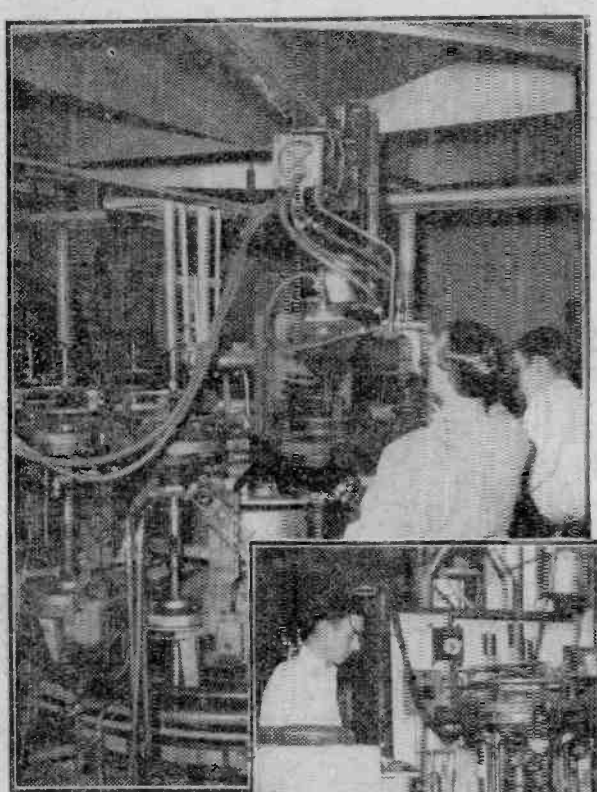
A FULLY automatic machine, recently developed and installed at the main Mullard valve factory at Mitcham, Surrey, is capable of joining together the necks and heads of television picture tube bulbs at the amazing rate of 60 an hour. This means that it is possible to obtain outputs of 500 bulbs in a normal working day, or nearly 1,300 in a day made up of three shifts. For working in conjunction with this new machine, special machines have also been developed for gauging, cutting, glazing and flanging the necks of the bulbs prior to the joining operation. With the addition of ingenious handling equipment and the installation of a fully automatic annealing tunnel or lehr, the finishing of television picture tube bulbs is now being carried out on a continuous, high-speed, mass-production basis.

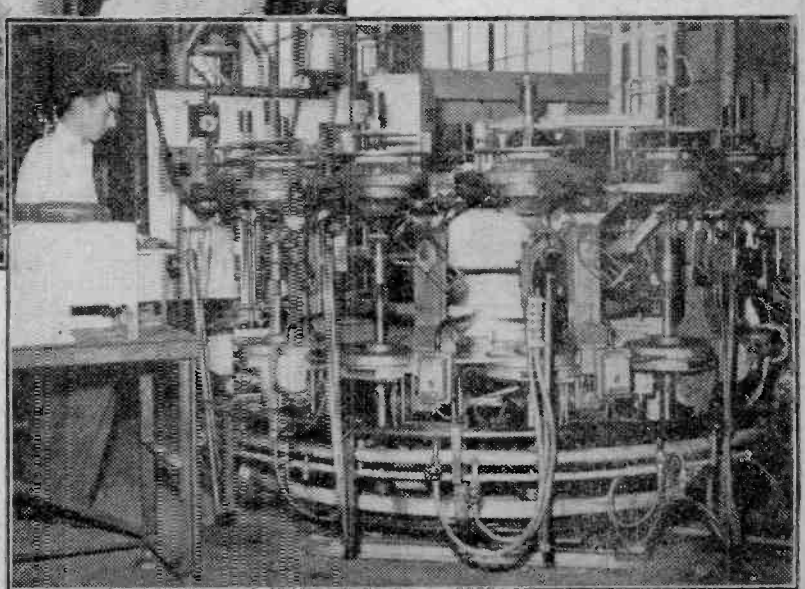
The importance of this achievement may be judged from the fact that the output of conventional glass parts joining lathes is usually no more than about 30 bulbs a day. Although in the past a number of these lathes were kept in continuous use at the Mullard factory, it became increasingly difficult to maintain an output of bulbs sufficient to meet the greatly increased demand for television picture tubes. It also became difficult to obtain a sufficient number of highly skilled glass workers for operating the lathes.

The twelve-head automatic glass parts joining machine now installed completely removes these difficulties. For example, four semi-skilled operators on the new machine can now turn out 60 bulbs an hour, whereas four highly skilled operators working on lathes maintain an output of no more than about 15 bulbs an hour. The new machine also has the tremendous advantage that it lends itself to modern handling techniques.

The success of the new installation depends to a very large extent upon ensuring that the glass parts fed to the main joining machine are of the highest possible quality and are very carefully gauged. A highly efficient handling system is also essential.

The new plant consists of a neck gauging and glazing machine, a seven-head automatic neck





The above illustration shows the completed bulb being removed from the machine by means of a vacuum chuck. When the chuck is not in use, it is housed in a box held at the same temperature as the finished bulb. On the right is the glass parts joining machine, showing the necks and heads of the picture tubes clamped in the work heads.

flanging machine, the twelve-head automatic glass parts joining machine and an automatically controlled annealing tunnel or lehr.

Automatic Handling

On the neck gauging and glazing machine the glass necks are marked off to the gauged length, and one end is glazed to prevent cracks from forming and to facilitate the later joining operation. This machine is controlled by a single operator, and is almost completely automatic in operation. The operator first inscribes the neck by means of an internally mounted diamond. He then places it on an inclined platform where it is automatically picked up by a slowly revolving drum. As the drum revolves, one end of the glass neck passes through a series of gas flames of increasing intensity. The glazing is completed during one revolution of the drum.

The neck flanging machine is also controlled by a single semi-skilled operator, and is almost completely automatic in operation. Here the necks are fed, by means of a seven-head rotating drum, through a series of flames of varying intensity. During the early heating stages, the inscribed portion of the neck automatically falls off, and the cut end of the neck is then glazed. In the sixth flame position, a carbon tool is automatically pushed into the end of the glass neck to form the flange. After a carefully adjusted "flaming-off" period, the flanged neck is removed from the drum.

The twelve-head glass parts joining machine is a development of the conventional type of machine universally employed in electric lamp and valve manufacture for such operations as stem-making, sealing-in, etc. At present it is being used for the finishing of 9in. bulbs, but it can be adapted for taking 12in. bulbs, if required. Basically it consists of 12 revolving heads for holding the parts to be joined, and a series of very carefully adjusted gas jets.

The new machine differs from previous types in that a completely new system of indexing is employed. In this system the work heads are indexed round by means of compressed air which is passed through a series of carefully adjusted valves. The positions of the valves are controlled by means of an electric motor, which in turn is controlled by an automatic timing device. In this way it has been possible to ensure extremely accurate and reliable indexing. The heads are indexed round once every minute so that a cycle of operations is completed in every 12 minutes. Working at full capacity the machine is thus capable of completing 60 bulbs an hour.

A particular advantage of the new machine is that it lends itself readily to continuous shift work.

Sequence of Operations

The sequence of the joining operation on the new machine is briefly as follows :

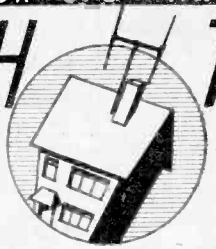
1. A flanged glass neck is taken from a box, and is inserted in a chuck forming part of the work head.
2. By means of a vacuum chuck, a bulb head is taken from a pre-heating box and is clamped in position in the work head.
3. The work head is now indexed round automatically. In the first five positions (including the load position) the parts to be joined are pre-heated by means of soft, air-gas flames.
4. At the sixth position the heating is increased.
5. At the seventh position a carbon roller forms a flare on the bulb head, and the chuck holding the stem is moved up so that the neck flange is brought into contact with the flare of the bulb head. This operation is accomplished by means of the upward movement of a rail at the base of the machine. The centre pillar of the chuck rides on this rail. After the joint has been completed it is "flamed off." The worker carrying out this operation is referred to as the Main Seal Operator.
6. The eighth position is reserved for annealing.
7. In the ninth position the Anode Seal Operator inserts the anode seal button.
8. The 10th and 11th positions are reserved for the final "flaming off" of the bulb.
9. The complete bulb is unloaded in the 12th position. This is accomplished in an ingenious manner. The neck is released from the chuck, and the clamping ring holding the bulb head is slipped back. The unloader then depresses a control marked "Down" forming part of the pistol grip, vacuum control unit. From a box, mounted on a gantry above the machine, a vacuum chuck is immediately lowered (something like a spider lowering itself on its thread). When the vacuum chuck is in contact with the centre of the screen of the bulb, the operator depresses the suction control on the control unit. Immediately afterwards he depresses another control marked "Up" and the glass bulb is "sucked" up and carried aloft; the box unit, holding the vacuum chuck, is then slid along the gantry to the loading position of the annealing tunnel. Here the bulb is lowered into a tray which, when full up, is pushed on to the conveyor belt of the annealing tunnel. The complete unloading operation is carried out in less than one minute, and during this time the bulb is untouched by hand.

In order to remove any strains which may be set up in the glass during the joining process, the completed bulbs have to be very carefully annealed. This consists of a gradual heating and cooling process. The annealer comprises a long tunnel heated by means of gas jets, carefully controlled to give a suitable gradation of temperature throughout the length of the tunnel. The bulbs are placed in trays and are conveyed through the tunnel on a slowly moving belt. When they reach the end of the annealing tunnel they are transferred to a cooling tunnel.

The installation of this new plant at the Mullard factory is a fine example of modern production engineering. Not only does it result in a remarkable saving in time and labour, but it helps to bring the manufacture of television picture tubes well within the scope of the continuous mass-production methods which, during the past few years, have enabled British valve manufacturers to meet the increasing demands of the rapidly expanding electronics industry.

TELEVISION PICK-UPS AND REFLECTIONS

UNDERNEATH THE DIPOLE



By Iconos

THE curve indicating the number of television viewers continues to rise on a steeper and steeper grade. It seems only a few months ago that the number of new TV receiving licences issued numbered only two or three thousands a month—and now the monthly increase is about ten times as many. The opening of Sutton Coldfield gave a tremendous fillip to the sale of receivers, surpassing the most sanguine estimates of many radio manufacturers and catching one or two of them unprepared for the rush. The demand for sets continues, in spite of the general shortage of money and rising cost of living.

A WISE DECISION

THERE are other factors which might have restrained buyers. There is the natural caution of many people who think that today's TV set may be out-of-date next year. The man-in-the-street who reads press reports of demonstrations of colour television or of black-and-white television in other countries working on a higher standard of definition may well pause before investing a large sum of money in a TV set. But, of course, he will have to wait many years before there is any possible chance of commercial colour television, and, as for those countries which operate transmission standards with more than 405 lines to form a picture—well, the answer is that at the transmitting end the utmost has not yet been got out of 405 lines. On the other hand, systems using a large number of lines, such as the experimental transmitter at Eiffel Tower, suffer from range limitations and are subject to heavy interference from automobile ignition and other "man-made" static. Most—though not all—radio men consider that the decision to retain the British standard at 405 lines was a wise one.

THAT OLD TV SET !

AS a matter of fact, I have been extremely interested to see the present performance of a few pre-war commercial "televisors," to use a term not often used now. On the whole, results are surprisingly good, and improvements in definition and gradation in individual transmissions from the A.P. are definitely reproduced, though the improvements are naturally not so noticeable as on the most modern sets. Some of the 1937 models had a multitude of controls and knobs, easily accessible, and these enable the receivers to be kept in tip-top trim. The most vulnerable parts of these old receivers (and all TV receivers, for that matter) are the electrolytic condensers. Sets which have been out of action for a long time are likely to break down in these condensers, and the purchaser of an old second-hand TV set would do well to strip out and replace these particular components *before* attempting to put the set into commission. Many a mains transformer has been burned out through not taking this precaution.

The principal differences in these old sets compared with the latest types are in the brilliance of the picture—due to improved cathode-ray tubes—and to more critical sharpness — due to improved frequency characteristics of receivers. Some of the old sets have electrostatic focusing and deflection, or a combination of electrostatic and magnetic controls, a point which should be ascertained before acquiring a TV "old crock." Replacement tubes for some of the electrostatic types of receivers are now practically impossible to obtain. And, of course, such sets would not be suitable for the single side-band transmissions of Sutton Coldfield. An interesting point about many of these old sets is the relative weakness of the high-pitched H.F. whistle, quite loud on most modern sets. This doesn't come from the loudspeaker, but from a transformer in the chassis. The noise can be reduced or practically eliminated by shrouding the offending component with glass wool or slag wool (materials used for soundproofing telephone boxes and lagging steampipes, amongst other things) and binding it into position with insulation tape. Slag wool is a heat insulator, as well as a sound and electrical insulator, and so should not be used to shroud components which run hot or require air circulation around them.

SLAG WOOL

INCIDENTALLY slag wool is the material which is the most effective to use in the Howe Box Baffle type of loudspeaker. The ideal baffle for a moving-coil loudspeaker would have a diameter of about eight feet. The same result is obtainable with a relatively small, solidly-made wooden box, with the moving-coil loudspeaker in one side and with no other opening. The box is lined inside with slabs of slag wool sound absorbent, thereby giving the same effect as an infinitely large flat baffle. The improvement in extreme bass notes is most noticeable. Readers who construct their own TV sets with separate loudspeakers may consider this refinement worthwhile in the interests of super-quality.

PICTURE BRIGHTNESS

THIS question of picture brightness has long worried the cinema industry. Viewers (and radio manufacturers !) can profit by their experience. Regulations require a certain amount of shaded house-lighting to remain on, together with exit signs, during all performances. The interpretation of these regulations varies with the authorities in different areas and upon the compliance by the cinema managements themselves. The effect upon the brilliance and contrast of the picture on the screen varies a great deal, too, with the type and colour of decoration of the auditorium. Picture brilliance is also affected by a smoky atmosphere, by dust and tobacco smoke deposits on the screen and by the texture of the screen itself. The perforations in the screen to allow the sound to come through it from the loudspeakers behind, is yet another factor—these vary with different makes. The texture of the screen itself may be flat white paint or rubber or plastic material, suitable for wide halls, or a beaded surface, more reflective (and directional) for a long, narrow auditorium, or a

silver screen—more directional still and suitable for a weak illumination.

The final result of all these variables is further complicated by the different types of arc lamp used ; high-or-low-intensity carbon arcs working on currents ranging from 10 amperes to 60 amperes, and giving an incident light upon the screen which measures anything from six to forty foot-candles and a reflection which varies according to the type of screen used. Accurate measurement of this reflected light is difficult, but the British Standards Institution's recommended figure is an incident light of twelve to sixteen foot-candles. It is interesting to compare this figure with the screen illumination of sixteen cinemas in a provincial district, recently undertaken by a Western Electric service engineer. The figures gave one small "art" cinema the enormous figure of forty foot-candles, followed by a locally-owned larger house at thirty, and all the rest varying from eight to twenty-four foot-candles. The big Odeon and ABC circuit cinemas had a fairly consistent result of about sixteen foot-candles. These figures can be compared with the eight foot-candles of incident light at present obtainable on big screen television, which, with a silver screen, gives a result about equal to a matt white screen illuminated with about fourteen foot-candles.

MEASURING TV SCREEN ILLUMINATION

IT is not easy to compare these facts and figures with screen illumination of cathode-ray tubes in commercial television sets, since the cinema and big screen television measurements are all taken with a "white" screen—i.e., projection machines turning over without film or TV scanning in operation and picture at "full white." But the comfortable *reflection* figure measured on a Weston light meter under these conditions is about a quarter of the measurement of the same light direct from the projector, i.e., a sixteen foot-candle light will give a reflection from a matt white screen of approximately four foot-candles. These Weston foot-candle meters are expensive instruments, however, and require careful calibration from time to time. Nevertheless TV service engineers should find this type of instrument useful in making measurements of CR tube screen illumination on a standard picture—such as the focusing chart which precedes all television programmes. And manufacturers will know when they reach the limit of brilliance beyond which they do nothing more than dazzle their potential customers and add more applicants to the long queue for National Health spectacles.

AERIAL IRONMONGERY

SOME of the aerials in fringe areas such as in the Yorkshire valleys, are weird and wonderful affairs. Two directors and a reflector are commonplace in some districts, while in others, extraordinary arrangements of multiple reflectors are used. Some of them are astonishing displays of tubular ironmongery, reminding one of the vertical versions of the horizontally disposed arrays of the short-wave amateur transmitter. Different valleys seem to have different schools of thought, and the height of some of these aerials—and their complication is an indication that reception is not too easy and that in fringe areas care has to be taken in order to obtain satisfactory results.

That it pays to take this trouble, I have seen for myself. A gain in signal strength of 50 per cent. together with a 25 per cent. reduction of interference makes all the difference in the world, and I feel sure that some of the readers of this journal are the very people who have put up these different types of aerials.

THE "BRUTE" LAMP

THE high-powered arc lamps used in Trafalgar Square on election night are not without interest. They comprised two huge 225-ampere high-intensity arcs known as "Brutes" which are normally used for Technicolor filming. Possessing very fine control adjustments and a particularly efficient optical system, they each give as much light as three of the standard 150-ampere arcs used in film studios and on certain outside television events. Carbon arcs may eventually be outmoded by the compact light source (high-pressure mercury) lamp, but technical progress on arcs has by no means stopped. On the "Brute," for instance, many ingenious accessories have been added. There is a small signal light which warns the operator ten minutes before his carbons are due to require replacing, and this signal starts flickering during the last two minutes of the carbon's life. Thus the operator has adequate warning to be prepared to renew and trim the carbons at the first convenient moment. The positive carbon, which revolves, has a life of one hour ; the negative lasts two hours. A special meter indicates the hours the lamp has been burning, up to 9,999 hours, thus enabling a maintenance and overhaul plan to be carried out at appropriate intervals based on actual burning time. A new lamp house back-opening device allows the operator to re-carbon without turning the lamp around. All these remarkable developments are the result of intensive research at the English factory of Mole-Richardson, an Anglo-American company. It is pleasant to note that the English branch seem to be ahead of the American side of the business so far as research is concerned. Competition in this field in England is intense. G.E.C. is another British company that has made great strides in both carbon-arc lights and the high-pressure mercury light. Both makes of lamps are used by the B.B.C. at the Alexandra Palace and also on outside television broadcasts.

TELEVISION PICK-UPS AND REFLECTIONS

TELEVISION has hit the north with considerable impact. When the history of Midlands television is written it will be found that the phenomenally successful relay of an ice-hockey match on the opening night of Sutton Coldfield gave it a terrific send-off. Shortly afterwards I commented in *Practical Wireless* upon the good luck that a popular provincial ice-hockey team—Nottingham Panthers—were playing, that the match was most exciting, and that the Nottingham boys made a spectacular win. But I did not for one moment realise the full value to television in terms of goodwill that this combination of favourable circumstances created. The broadcast itself was first class, both technically and from the presentation point of view, including the commentary. This fact alone, would ensure a good start to the Midlands service. But the Nottingham's win was seen by many thousands of Midlanders and Northerners who crowd around the relatively few sets. I have recently been travelling in the northern Midlands, South Lancashire, Cheshire and Yorkshire and have heard universal praise of the initial programmes relayed from Sutton Coldfield. Aerials are popping up all over the place—in districts which are many miles beyond the recognised service area.

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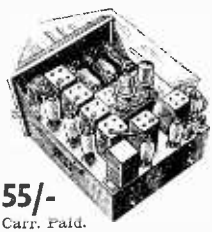

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Television and the Housewife

Popular Broadcaster in "Woman's Hour," JOAN ROBINS Discusses her Programme

"TELEVISION is different," you must have heard the enthusiasts say, "it has the films and the radio and all the magazines rolled into one, and the best of each of them." Well, that's as maybe, but it is certainly the aim of the programme planners at Alexandra Palace. If it is true of any particular programmes, it should be true of those for the housewife, because television enables you to see at first-hand and close-up the expert and practical way to do the hundred-and-one jobs the housewife is expected to do. And at the same time, you can hear the methods and the details explained by people who do know what they are talking about. It's as if the expert were to come into your own home to give you a few practical hints on the seamy side of spring cleaning or on what the new soapless detergents will and will not do.

A studio view of Joan Robins before the camera.

Writers on domestic subjects have always felt the difficulty of finding words and phrases to convey their exact meaning to the reader. And, I'm sure, you must have puzzled many a time over a phrase in a cookery article such as ". . . beat to a creamy consistency." Just how creamy does the author mean: thick, thin or clotted? Now, that's where television comes into its own. The camera takes you close up to the bowl in which the batter is being beaten, almost puts your nose into it, and when it has reached the right consistency the demonstrator can hold up the ladle and let the mixture run off the end to show you just how creamy it should be. Take omelettes, for instance, which are easier to make and far nicer to eat than our homely scrambled eggs. Only a genius could learn to make an omelette by reading a cookery book, but with the aid of your television set you are standing right at the elbow of the cook as she goes through the few, simple, but delicate operations that are the secret of the most perfect of all egg-dishes.

This is true of all the subjects which television brings home to the housewife, dressmaking, simple repairs about the house, labour-saving gadgets, interior decoration and so forth. How much easier it is for the expert to explain and for the viewer to understand by television, rather than by written instructions, such intricate matters as the arrangement of a bowl of summer flowers. Of course, film technique can do the same if it likes, but for many good reasons, such as time, entertainment value and the rivalry of the cinema organist, the makers of those excellent film magazines do not attempt to put on items especially for the housewife.

Spontaneity

In any case, I cannot help feeling that film production lacks one element that is always present in a television show—spontaneity. A performance on television is what the film-men themselves would call respectfully, "a one-take show." The programme producer at Alexandra Palace likes to have some form of written scheme of what the demonstrator is going to say, and even more important from the producer's point of view, a scheme of movements so that we don't go dashing all over the set and bewilder the camera and sound men. Despite all this preparation and the rehearsals which usually take up most of the morning, one does not attempt to become word perfect before the actual show. It is one of the real charms of this kind of television programme that there is a sense of naturalness and homeliness, which I hope does get through to the viewers. It's great fun and also most instructive to watch such experts as Philip Harben, W. P. Matthews, and Margot Lovell rehearsing their movements, arranging to tilt a particular object in such a way that the camera can get the detail, and then to sit back and watch the show come over on the screen; the same movements, but brought to life by the quiet explanations given in a friendly and spontaneous manner.

But this same spontaneity can be a very dangerous element, indeed. A one-take show is a grand opportunity for all the gremlins in the world to crowd around and enjoy themselves. Vital objects disappear from the demonstration table, the labour-saving gadget is patently obstinate and I think Bill Matthews has a special little gremlin which lives in his lighter and blows out the flame at the crucial moment. Of course, gremlins are not the only people in the studio who cause mischief. My particular piece of trouble was an enthusiastic amateur cook and a member of a well-known dance band (Edmundo Ros). He was so interested in a Christmas cake that I was baking in the studio before the show, that he could not resist the temptation to see how it was getting on. So, while I was out of the studio he kept having a peep into the oven, with the sad result that the cake sank in the middle and at the end of my show I had to produce a rather depressed-looking cake. This sporting element of risk puts a keen edge on the television performance and on the whole improves it, but please make allowances for the occasional calamity which occurs.

Some Difficulties

Now that I have had a chance to air my pet ideas about the advantages of television, I must agree that there are a lot of difficulties about these particular programmes as the viewer sees them. For one thing, it is not always possible to see everything clearly. The expert holds a gadget up and says glibly, "Now, watch what happens when I press this button." You watch and can't see a thing, because the object has reflected some light into the camera. It's infuriating, but we are learning all the time, and with better cameras and lights that disadvantage is becoming a back number.

From both your side and ours there is the vital question of time to be considered. Not only is there the problem of fitting a particular subject into 10, 15 or 30 minutes, but there is the question of how much detail is wanted by the viewers on special points. That mythical creature "the Average Housewife" is no help. The producer and the performer have to decide between themselves how to treat a subject. I find that the best way with my programmes is simply to imagine myself talking to a friend and showing her how a thing is done. My television friends have varying experience in domestic matters, according to the plan of the programme. For what would be the use of showing a friend who has been cooking for years the exact details of making short crust pastry, when she wants to get new ideas in a few quick suggestions? I have another younger friend who has just started housekeeping, having come out of the Forces where she came no nearer to food than eating and grumbling about it. Well, she wants to know every single, little detail and that is quite a problem. We are hoping to solve her particular problem by a new series on the "Basic Principles of Cooking." Philip Harben is the editor and leading demonstrator, while Marguerite Patten and I are sharing the task of explaining and demonstrating the why's and how's of cooking.

There is a wide range of programmes for the housewife, arranged to fit in with each other so that it will be possible for you to choose the ones that affect you most nearly. Speaking as a viewer, I thoroughly enjoy those dealing with clothes in the very practical series arranged by Mary Malcolm, called "In Your Wardrobe." This deals with such diverse subjects as the choice of smart and comfortable shoes and the planning of a spring ensemble. The practical approach to the care of clothes has been especially interesting. Every now and again you can get a glimpse of the London and Paris fashions and, to keep your spirits and purse happy, a parade of Utility dresses and hats which can be bought in the local shops for between £3 and £8.

The recent series of demonstrations on "Home Decoration" are a good example of the practical and instructional programme, as they not only banish the bogeys of such jobs as wall-papering, but inspire you to tackle really enjoyable tasks like painting furniture. The programme "Design for Living" is produced like a magazine with items on books, music and art exhibitions, and introducing to you women who are interesting because they have achieved something in their various walks of life.

And this is where you, as viewers, can be of great assistance to the programme planners and of advantage to yourselves, by first of all writing to say which programmes you are enjoying and asking for subjects which you would like to see produced. Then, many of you will have really valuable suggestions to offer on all matters dealing with home life, which we shall be only too glad to consider. There is nothing more stimulating than constructive criticism.

The Testoscope

THE "Testoscope" consists of a high-grade discharge tube having platinum insert electrodes and pressurised to give critical operation in respect of voltage. This is housed, together with a suitable chain of resistors, in a tube of first-grade ebonite.

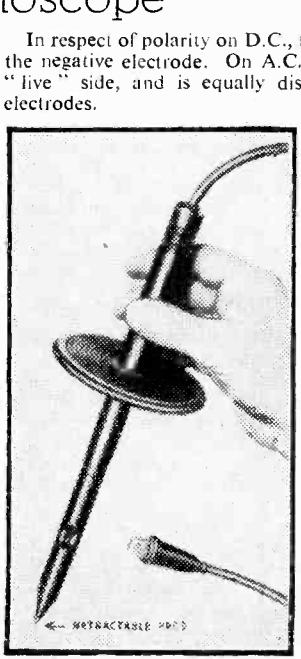
It is furnished with a retracting point shield and large diameter handguard so that test on "live" equipment may be carried out in the utmost safety. The body of the instrument is made as small in diameter as is compatible with safety, in order to give the utmost accessibility when testing.

An "earthing" lead is supplied which may be plugged into the handle. This provides both an additional safety measure and a means of "closed circuit" testing when required.

The instrument is supplied as standard for operation on equipment up to 12 kV maximum, but a combination of spring-loading and spacers in the barrel permit changing the resistors to vary the range of application if necessary. (Such changes should only be carried out by qualified engineers capable of conducting the necessary safety tests.)

Without the "earth" lead, glow commences at 750 volts; with the "earth" lead connected, glow commences at 350 volts. The instrument, therefore, is suitable for carrying out circuit, component and polarity tests on all equipment and wiring at potentials between 350 and 12,000 volts.

In respect of polarity on D.C., the glow centres around the negative electrode. On A.C. the glow indicates the "live" side, and is equally distributed between both electrodes.



With a little experience, the degree of glow can be used as an approximate estimation of the voltage.

Although not a test instrument in the normal manner (that is, of the meter type) it is believed that this is the only unit on the market which is capable of carrying out nearly all the electrical tests required in normal television or wireless maintenance and repair shops, bearing in mind, of course, that whilst it gives a certain indication of the presence of a voltage, the magnitude of it is merely estimated.

Correspondence

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

TELEVISION AERIALS

SIR,—Various methods are employed by dealers and others on siting television aerials, and often very different decisions are arrived at in one locality, as will be seen by the different directions in which the aerials are pointing.

Local interference and other factors often call for a deviation from the true bearing, but in a *straightforward* installation the following method is suggested as an 100 per cent. accurate method, without any necessity for maps, compasses and other impedimenta, or even much trial and error.

In the case of Alexandra Palace, its position is first computed as being, say, 20 deg. south of Brookmans Park by reference to a map and its angle noted.

Having established this fact once for any one particular town, any installation can be checked on Brookmans Park by any simple broadcast band portable set, and the bearing for this being easily found, and not affected by local screening. The television aerial can then be erected at 20 deg. south of this bearing with certainty of it being correct to a degree or so, and best for most normal installations.—R. WARD (Reading).

RECEPTION OF RADIO PARIS

SIR,—It may be of inferest to note that I successfully received the Radio Paris programme on my home constructed TV. (a set based on the R1355 receiver). I was tuning to the B.B.C. on Friday, March 31st, at 21.00 hrs. when it was apparent that the French programme could be faintly observed. In order to improve the signal I swung my dipole (standard H—home-constructed—30ft. pole) in a southerly direction and both sound and vision were up to, and at times better than, A.P. signal strength. A play was in progress which finished about 21.15. I then readjusted to A.P. as the station closed down at this time.

Later—at about 22.15—purely as an experiment—I returned to Radio Paris and, to my surprise, a picture (and sound) was again obtained—but this time it was a *negative picture* (reversal of blacks and whites). The programme was obviously a talk on cancer and cancer operations.

I would repeat that the picture in both cases was good, and up to the standard of B.B.C. reception in my locality (350ft. above sea level).

I have not been able to obtain satisfactory reception of Radio Paris since that date.—F. P. PARKER (Portslade, nr. Brighton).

STABILITY AIDS

SIR,—As a professional radio tester and fault finder, I was interested to read R. Cheeseman's letter on the EF50 (VR91) ex-service valve, of which I have tested over 20,000 in actual circuits.

He appears to take for granted that this type of valve has been made by one manufacturer, and will consequently behave as others of its type, provided the valve is not basically faulty. This is far from being the case.

In actual practice the behaviour of the VR91 in circuit is not readily predictable from a reading of its static, or even dynamic, characteristics. Indeed, no two valves made by the same manufacturer have given quite the same results when used in circuits at V.H.F. But the difference between various manufacturers of the same valve is most marked; the poorest and most divergent results being obtained by those VR91s made under lease-lend overseas. The best and most consistent results being obtained by Mullard.

Having tested VR91s in various practical circuits: as R.F. amplifiers from 100 Mc/s to 124 Mc/s, as frequency multipliers, as mixer valves at V.H.F., as I.F. amplifiers at 9.72 Mc/s., etc., I have found that the operating voltages are really quite critical, depending on the type of circuit used. Using cathode heating, the input impedance, stage gain, and bandwidth varies with the cathode voltage to a remarkable degree, over 1 volt (in 100 M-volt steps) under its working voltages, and the valve loses its gain quite rapidly from about 100 Mc/s upwards. I must disagree that the suppressor grid is sometimes better taken to cathode. At V.H.F. it denotes a fault. My average of rejects of brand new and boxed British VR91s is roughly over 10 per cent. A mere handful in comparison to those under lease-lend. Their faults are too numerous to mention, some of the common and easy faults being faulty insulation driving the control grid positive, and wrong heater resistance—too high or too low.

Concerning the valve base, I find that this falls mainly into three distinct types: ceramic, plastic and paxolin. By far the best, both mechanically and electrically, is the ceramic type. R.F. leakage is low and the ceramic base will withstand heat. The plastic type valveholder suffers in both these qualities. The application of a hot iron simply melts the holder, and the pins drop out.

In the ceramic type, the valve pin holder should be Y-shaped. Pin gauge the holder and make quite certain that the valve pin holder grips the pin gauge, and releases with a spring-like action on withdrawal. A paper-clip makes a rough but suitable pin gauge. Do not attempt to clean the valveholder with either trychlorethelene or carbon tetrachloride, as this will soften the metal which will lose its springiness, besides making it difficult to insert the valve without damage.

With a little intelligence, either of the metal retainers, whether spring grip or screw, can be used to secure the valve to the holder. If these instructions are carried out with care, instability due to valveholder should then become non-existent, and it will not become necessary to take G3 to cathode instead of direct to ground.—BERNARD SHATSMAN (Manchester, 14).

New Industrial Television System

Simple Compact System, Based on New Vidicon Tube, Extends Sight for Aid to Science, Industry and Education-system, and can be Adapted for Colour Pictures

A NEW and highly effective television system that extends human sight far beyond normal limits for benefits to science, industry and education was disclosed and demonstrated in New York at the 1950 Convention of the American Institute of Radio Engineers.

The new system, which produces excellent black-and-white pictures at normal light levels, can be adapted to produce pictures in natural colours, according to Dr. V. K. Zworykin, vice-president and technical consultant of RCA Laboratories, who directed development of the system.

The new system, the smallest and simplest ever devised for non-broadcast, industrial television operations, is based on a remarkably small and sensitive pick-up tube known as the Vidicon. The system consists solely of two units—a television camera approximately the size of a personal 16 millimeter movie camera and a master control monitor that can be carried as easily as a suitcase.

Great Promise of New System

RCA industrial television promises tremendous contributions to twentieth-century industry, education and science. The achievement of smaller and less-costly television chains (camera and monitor combinations) which provide excellent performance will hasten the coming-of-age of this new service.

Closed-circuit television can be a powerful instrument of education, bringing great teachers into the presence of hundreds or thousands of students. It can bring virtually any number of doctors to the side of a surgeon for observation of rare operations. It is the expendable eye that can watch dangerous industrial and scientific processes.

This service will eventually be available in colour, as well as in black-and-white. While surveys have indicated that black-and-white coverage will meet the requirements in most industrial uses, engineers at RCA Laboratories are at the present time working on colour equipment to fulfil needs that may arise.

There were two separate phases in developing the system. First came the building of the Vidicon pick-up tube, which operates on the principle of photo-conductivity rather than employing photo-emissive cells as used by the image orthicon, the orthicon and other pick-up tubes serving as the electronic "eyes" of conventional television cameras. The second phase consisted of engineering and designing the camera and monitoring-control unit.

Simplicity of Vidicon

Despite its reduction in size to less than a tenth of that of the image orthicon the Vidicon is able to transmit pictures at normal lighting levels and to attain a resolution of more than 500 lines. The tube is only 1in. in diameter and 6in. long.

The simplicity of the construction and operation of the Vidicon is an important advance. It contains only an electron gun and a target, as contrasted with gun, two-sided target, image section and electron multipliers of the image orthicon tube. The Vidicon's related equipment is proportionately less complex.

A number of materials have been found to be satisfactory for the photo-conductive target, and by proper selection and processing of the materials it is possible to make a target sensitive to the entire visible range of the spectrum.

Whereas the Vidicon was designed specifically for industrial television intensive research is being carried on at RCA Laboratories in the development of tubes of this type for use in RCA's new all-electronic, high-definition colour television system. It is expected that further development of the Vidicon will improve its quality sufficiently to make it a valuable device in commercial black-and-white telecasting.

Light sensitivity obtainable with photo-conductive cells such as those used in the Vidicon is many times greater than the sensitivity which can be allowed with photo-emissive cells such as employed in image orthicons. Theoretically it is possible to devise a photo-conductive tube ten times as sensitive as the image orthicon. In addition, it has been found that ordinary 16 mm motion picture lenses, which are relatively inexpensive, work satisfactorily with the 1in. Vidicon.

Lower Power Consumption

The entire system operates on 110-volt, 60-cycle alternating current and consumes only 350 watts, about one-third that used for an electric toaster. It is capable of transmitting a signal 500ft. over a coaxial cable closed circuit, giving enormous flexibility for a wide range of industrial, scientific and miscellaneous applications.

The system is almost compatible with standard television broadcasting techniques. Home television receivers can be adapted to use as monitors by the addition of a single tube, with accompanying resistors and capacitors, at a very modest cost.

The system has inherited a good part of its simplicity and small size from the Vidicon tube, which is considerably less damaging in its requirements of power and associated equipment than the image orthicon.

The Vidicon requires no electron multiplier equipment, and, since it is smaller, less deflecting power is required. The new deflecting circuits were engineered for simplicity and compactness. Miniature tubes, used for the first time in a television system, help to cut down on size.

In broadcast television field equipment now in use, the synchronizing generator alone requires a separate case. The generator for the Vidicon system has been reduced to the size of two cartons of cigarettes.

The master control unit of the system is 24in. long, 15in. high and 8¾in. wide, and weighs 58 pounds. It contains a regulated power supply, small synchronizing signal generator, a video amplifier strip and all the scanning deflection equipment for both the camera and its own 7in. monitoring C.R. tube. It has 44 valves, about 50 per cent. more than the average home television receiver.

The camera is 10in. long, 3¾in. wide and 5in. high and has a remote focusing mount, which permits the operator to adjust optical focus by remote control.

SUPREME RADIO, 746B, Romford Road, Manor Park, E.12 (Tel.: ILF 1260).—P.M. Focus Units for Mullard tubes. **15/-** ea.; for Triodes. **16/-** ea.: V.C.R.97 Tubes for television, **35/-**; Black Masks for same. **3/6** ea.; latest type Magnifier for above. **25/-** ea.; E.F.50 Valve Holders. Ceramic. **6d.** ea., **5/6** doz.; Retaining Rings for same, **9d.** ea., **8/-** doz., screw type; E.A.50 Valves and D.I.. new. **3/-** ea.; Valve Holders. bakelite type, for same. **6d.** ea.; Co-Ax Cable. 80 ohms. **1/-** yd.. **11/-** doz. yds., as above. but 50 ohms **6d.** per yd.. **5/6** doz. yds.; Aerial Plug and Socket for same, **1/-**; Twin-balanced Feeder. **5d.** yd., **4/6** doz. yds.; screened as above. **1/-** yd., **11/-** doz yds.; Fly-back type Line Trans., 5.5 k/v. output, **22/6**; 2.5 k/v E.H.T., with 4v 1.5 amp., and 4v 2 amp. C.T. **27/6** ea.; Tapped Primary. 0.1 MFD. 2.5 k/v Insulated Case Cond.. **3/6** ea.; 8m.m. Aladdin Coilformers with cores. **8d.** ea.: 6m.m. with cores. **6d.** ea.; Wound Coils for London E.E. Televisor. **1/6** ea., Choke **1/-**. All parts in stock for Home Constructor Televisors. Comprehensive range of ¼ watt and ½ watt Resistors always in stock. **3d.** ea.; Mica Cond.. 40PF, 50. 60. 65. 305. 307. 500. 530. 570. 590, 700. 1.800 and 4.550 PF. all at **2/-** doz., or ass. Terms: C.W.O.: no C.O.D. Send 6d. extra for postage orders under £5, 2½d. S.A.E. all enquiries and lists.

EX-R.A.F. Pre Amp. 45 m/c, with diagram for conversion to sound and vision, local and fringe, **19/6**; .01 x 4.000v., oil filled, **1/3**; 50 assrtd. Sil Mica, **10/-**; 50 assrtd. Res., 1/6; 16 x 16 Elect. **2/6**; ex-Govt. Valves from **2/6**. Send for latest "Cheapest List in England." SUSSEX ELECTRONICS, LTD. (T.). Riley Road, Brighton, 7.

TELEVISION AERIAL COMPONENTS. Alloy Tube. drawn in AW.10.C.; Mast-head Brackets alloy and wood masts, Chimney Brackets, Corner Plates and Lashing Cable, J. Strainer Bolts, U Bolts. etc. WALTER CRANE. Electrical Engineers, Wakefield. (Telephone: 2172.)

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OF HISTORICAL INTEREST: "Television" (recently "Electronic Engineering") 1934-1940, £5; complete except 3 issues 1939-40. "Practical Television," vol. 1-2, 1934-35, only 15 issues published, £1. "Journal Television Society," vol. 3, 1939 to date. £7. 31, Wilmington Way, Brighton. 6.

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RATES

3/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 6d. extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Television," Tower House, Southampton St., Strand, London, W.C.2.

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VIEWMASTER Resistor Kits. **11/6**, plus 3d. postage. Huge range of Television and Radio Components at competitive prices. Resistors. ½w. **2d.** each, **1/9** doz.; ½w. **4d.** each, **3/-** doz: 1w. **6d.** each, **4/6** doz.; ranging from 2.5 ohms to 100 megs. Condensers 2pfs to .25 mfd., **6d.** each, **4/6** doz. All plus postage. CRESCENT RADIO (Dept. A.). 233. High Road, Wood Green. N.22. (Telephone: Bowes Park 3206.)

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TELEVISION. Radio Amplifiers: Repairs, modifications; special equipment built to order; home-built receivers, aligned and tested; large stocks of high-quality Components, Valves, etc.. Transformers to spec. Chassis drilled and punched. BERNARDS. Radio Engineers. 12. Chelverton Road, Putney, London, S.W.15.

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When replying to advertisements please mention PRACTICAL TELEVISION

Assistant Superintendent Engineer, Television

MR. H. W. BAKER, who has been Engineer-in-Charge of the London Television Station at Alexandra Palace since 1946, has been appointed Assistant Superintendent Engineer, Television.

Mr. Baker left the Marconi Company in 1926 to come to the B.B.C., and was appointed Assistant Engineer-in-Charge at Alexandra Palace in 1937, soon after the station opened. During the war Mr. Baker was successively Engineer-in-Charge of the Lisnagarvey transmitting station in Northern Ireland and of the high-power long and medium wavelength station at Ottringham, near Hull, which broadcasts B.B.C. programmes to Europe.

Trinder Pulls Their Leg

IN New York, recently, Tommy Trinder was asked whether we in England had television yet. He rose to the occasion by saying that we were still listening to radio by cat's whisker and crystal but that we had heard a new invention which used valves and a loudspeaker.

Hydraulic Mast

AN American firm is reported to have developed an amateur mast, suitable for television receiving aerials, which may be raised and lowered hydraulically. A hand pump is used to raise the mast, and it can be stopped at any desired height. The height is 68ft. fully extended.

Appointment of Engineer-in-Charge, Alexandra Palace

MR. H. WALKER, O.B.E., A.M.I.E.E., has been appointed Engineer-in-Charge of the London Television Station, at Alexandra Palace, in succession to Mr. H. W. Baker, who was recently appointed Assistant Superintendent Engineer Television.

Mr. Walker has been with the B.B.C. since 1931. During the war years he served in the R.A.F. He joined the staff of the London Television Station just before it opened in 1936, and returned as Assistant Engineer-in-Charge when the service was restarted in 1946.

Amateur Television Camera

THE accompanying illustration shows an amateur-built camera in action at the Shefford Radio Club's amateur television demonstration recently. Many interesting visitors were present, including a Post Office representative, and all agreed that the transmission was as good and clear as that of the B.B.C.

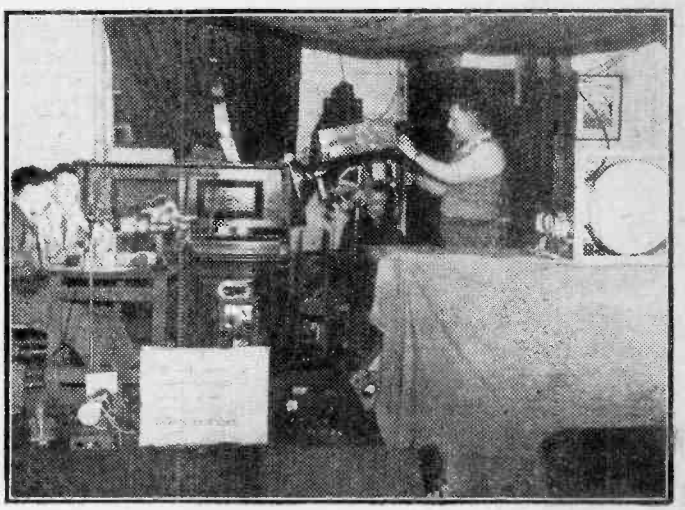
Set Production in U.S.A.

ALMOST 4,000,000 post-war television receivers had been produced in the United States by the end of 1949, the Radio Manufacturers Association said recently in a report on television and radio set production for the year.

Total industry production for 1949 was estimated at more than 2,800,000 television receivers and in excess of 10,000,000 radios on the basis of R.M.A. reports projected for all set manufacturers. TV set production in 1948 was estimated at 975,000 and radio output at about 16,500,000 sets.

Manufacturers reporting to R.M.A. made 292,061 TV sets in December, despite a slow-down in assembly lines due to the Xmas holidays and a change-over by most manufacturers to 1950 models for January showings.

Fourth-quarter television receiver production represented 42 per cent. of the year's output and exceeded the combined production figures for both the first and second quarters of the year.



The amateur-made television camera at the Shefford radio club.

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Television." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to: The Editor, "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Slot Meter Television

THE managing director of a London radio firm has produced an attachment consisting of a slot meter, which when connected to a television receiver will provide half an hour's viewing for 1s. This method of providing television entertainment is ideal for installation in boarding houses, hostels, etc. No charge is made to the hostel or hotel for the set and the firm install and take full responsibility. To prevent programme interruption a warning light shows up two minutes before the expiry of the period.

International Fair, Milan

ALTHOUGH only three manufacturers showed television equipment at the International Fair, the disclosure of the official television plans and the tremendous interest aroused by the only British television exhibit have made the Italians television conscious almost overnight.

Shortly before the opening it was learned that the Senate had passed the plans of Signor Spataro, Minister of Post and Telecommunications, for a £15,000,000 extension network for Southern Italy, and that as well as telephone channels two television channels would be provided throughout to bring all Southern Italy and Sicily within a television network.

Television broadcasts for Northern Italy within a year were immediately prophesied, and interest is now being further stimulated by what has proved to be the biggest draw of the Fair; the continuous demonstrations of colour television by the British firm of Pye, Ltd., of Cambridge, who flew their equipment across Europe from the Utrecht Fair.

The C.C.I.R.

THE International Radio Consultative Committee (C.C.I.R.) is a body of technical experts meeting under the general regulations of the International Telecommunications Union (I.T.U.). The C.C.I.R. met at Stockholm in 1948, and at that meeting Study Group No. 11 was set up. This study group is specially concerned with a study of the technical factors controlling the co-ordination of television standards. It held its last meeting at Zurich in July, 1949, and met in London on May 6. To prepare the way for discussing the technical aspects of co-ordinating television standards, members are investigating television systems and seeing research establishments and factories. They have already been to the U.S.A., France and Holland.

Radio Industries Club

AT the 19th annual general meeting of the Radio Industries Club, held at the Connaught Rooms, London, on Tuesday, April 25th, Mr. Norman Collins was unanimously elected president of the club for 1950-51. Mr. Collins, Controller of Television of the British Broadcasting Corporation, took over the presidency from Lord Burghley, K.C.M.G., at a luncheon which followed the annual meeting.

During the course of the luncheon a president's microphone, to be used at all future meetings of the club, was inaugurated. The microphone is mounted on a specially designed table stand representing a lattice aerial mast, and at the base of the stand the names of all the presidents and chairmen of the club to date are engraved. The microphone and stand are entirely gilt.

A ballot to fill five vacancies on the committee of the club resulted in the following members being elected: Messrs. A. J. Dew, H. de A. Donisthorpe, W. E. Miller, W. G. J. Nixon and Owen Pawsey.

At the first meeting of the new committee held after the luncheon the following officers were elected for 1940-51: Chairman, Guy R. Fountain; vice-chairman, J. G. G. Noble, M.C.; honorary secretary, W. E. Miller; honorary social secretary, F. H. Robinson; honorary treasurer, Owen Pawsey.

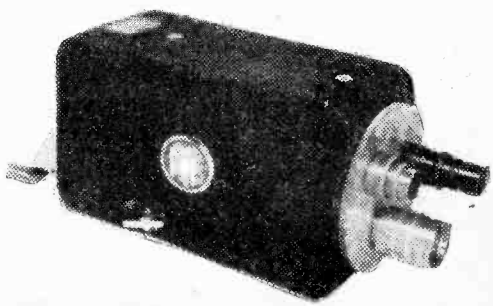
Children's Hour Producers

THE B.B.C. has appointed three men and four women as producers for Television Children's Hour. Television children's hour is being transferred from Alexandra Palace, where it has had no permanent studio of its own, to a new studio at Lime Grove, Shepherd's Bush, this month. This will be the first studio to be developed in the new premises.

No head of television children's hour has yet been appointed. The work of the producers is being co-ordinated by Mr. Richmond Postgate, head of schools broadcasting since 1947 and now temporarily attached to television.

Soon after the start of children's hour in the new studios a midweek hour will be introduced on Wednesdays, beginning on May 31. The number of hours will be gradually increased until the programme becomes a daily event.

The world's first "Walkie-talkie" television camera in action.



A close-up of the new camera, showing the turret lens head.

TRADE TOPICS

Plessey Television Components

A NEW and comprehensive range of television components, embracing deflector coil assemblies, scan output transformers and focusing units, as well as control resistances, loudspeakers, electrolytic capacitors, R.F., I.F. and filter coils and chokes and transformers, has recently been introduced by The Plessey Company, Limited, Ilford, Essex.

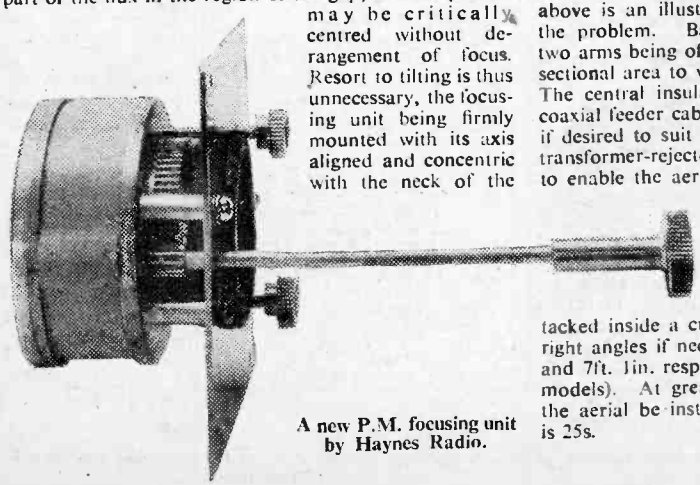
Each component has been designed to allow maximum advantage to be taken of contemporary television receiver circuit simplification. In some instances standard radio components have been adapted by special reinforcement of characteristic or modification of construction, and basic components are individually designed to be as flexible as possible to suit the many alternative combinations of circuit, valve range and cathode-ray tube type as well as the possible various electrical operating conditions.

Several of the scanning and output transformers in the range are based on the company's special television grade of "Caslam" moulded core material. Low losses at the higher audio and ultra-sonic frequencies and freedom from objectionable noise-producing magnetostriction effects are claimed to make this material eminently suitable for use in television applications. Produced in block form, it is simple to assemble, reducing damage to delicate windings of the type encountered in scanning components. These components are available retail from :

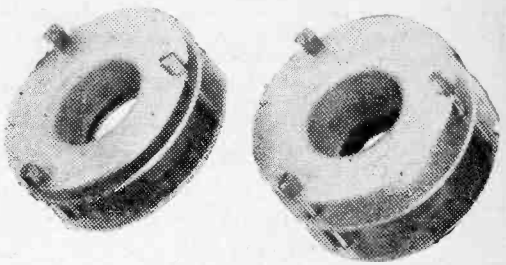
Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.2.

Haynes P.M. Focusing Unit

TWO new types of TV focusing units have been introduced, the PM15A and the PM20A, for use with tetrode and triode C.R. tubes respectively. These are fitted with vertical and horizontal shift controls conveniently placed at the back as well as a focusing adjustment operating at the rear and beyond the base of the tube. Shift is produced by a slight movement of a "shuffle" plate which engages only a small part of the flux in the region of the gap, and the picture may be critically centred without derangement of focus. Resort to tilting is thus unnecessary, the focusing unit being firmly mounted with its axis aligned and concentric with the neck of the tube for which support is provided. The focusing control by variable gap works through gears and the control knob may extend out at the rear of the cabinet affording the same ease of adjustment as that offered by the variable resistance used with focusing coils.



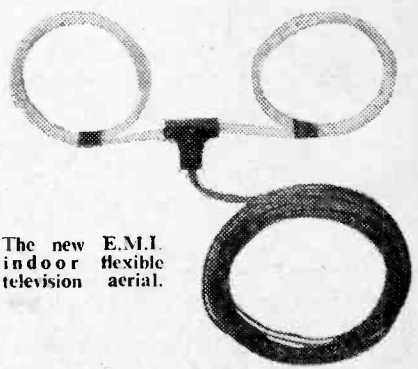
A new P.M. focusing unit by Haynes Radio.



The Plessey P.M. focusing unit, available in two types for triode or tetrode tubes.

Alcomax III or equivalent alloy is used for the magnet ring. Fully described in Haynes Technical Publication No. 44. Retail price 36s.

Haynes Radio Ltd., Queensway, Enfield.



The new E.M.I. indoor flexible television aerial.

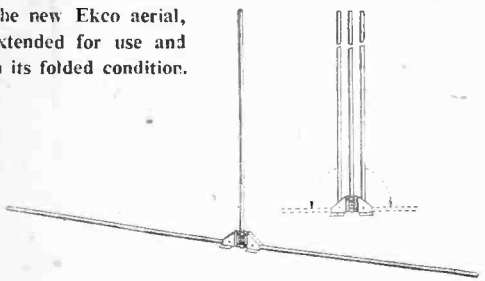
E.M.I. "Flexible Dipole"

VARIOUS ideas have been put forward for the design of an indoor television aerial, and shown above is an illustration of the new E.M.I. solution to the problem. Basically, it is a standard dipole, the two arms being of flexible material with sufficient cross-sectional area to warrant a good wide acceptance band. The central insulated mounting block carries 24ft. of coaxial feeder cable which may, of course, be shortened if desired to suit the prevailing local conditions. The transformer-rejector coupling provides wide matching to enable the aerial to be used with practically any of the standard types of receiver now available, and special tacks are provided to enable it to be fitted. Within the range of about 10 miles from the transmitter the aerial may be arranged by the side of a door or window, or tacked inside a cupboard, the lower arm being bent at right angles if necessary (the overall length is 10ft. 1in. and 7ft. 1in. respectively for the London and Midlands models). At greater distances it is recommended that the aerial be installed in a loft or attic. The price is 25s.

E.M.I. Sales and Service, Ltd., Hayes, Middlesex.

Ekco Indoor Aerial

ANOTHER new type of indoor aerial has been produced by Ekco, and is intended for mounting in a loft or attic. It consists of a base-plate to which three rods are connected, the two outer sections folding so that the aerial, when installed, represents an inverted "T." The aerial is non-directional, and it is only necessary, therefore, to screw the baseplate to a convenient joist so that the centre rod is vertical and the side rods horizontal—keeping them well clear of roof, water tanks,



The new Ekco aerial, extended for use and in its folded condition.

electric conduit, etc. It is permissible to tilt the aerial array where insufficient head-room is available. As an alternative the aerial may be suspended, and in extreme cases a further assembly may be positioned to act as a reflector. The down-lead should, of course, be taken in the most direct manner to the receiver. It is claimed that the aerial gives satisfactory reception within 15 to 20 miles of a transmitter. The price is 25s. (no Purchase Tax).

E. K. Cole, Ltd.,
Ekco Works, Southend-on-Sea.

Television Receiver Price Alterations

WITH reference to the prices of Baird television receivers quoted in our last issue, we are asked to point out that some changes were made after we went to press, and the present prices are as follows :

"Everyman" (A.C.)	£40 19 0
,, A.C./D.C. version ..	3 guineas extra
"Townsman"	£80 17 0
,, with radio	£92 8 0
"Countryman"	£94 10 0

The above prices are inclusive of purchase tax.

Messrs. Cossor also announce that their Console Model 917 is now £63, tax paid.

Homelab Signal Generator

THE Homelab instrument is very moderately priced, and is designed to meet the needs of those requiring a good instrument for routine tests and measurements on radio and television receivers. Description :

R.F. Oscillator : A negative resistance circuit of proved stability and freedom from frequency drift is employed.

Audio Oscillator : The triode section of a double-triode valve is connected in a reversed feedback circuit and generates a 400 c.p.s. voltage for modulation of carrier and A.F. tests.

Buffer Stage : The other triode section of the latter double-triode valve is employed as a cathode-follower buffer stage. This has the advantage of isolating the R.F. oscillator and provides a low-impedance source from which the R.F. attenuator is fed. When the 400

The Homelab signal generator.

c.p.s. voltage is required a switch connects this stage as a conventional triode amplifier.

Modulation : Modulation is applied to the buffer stage and the undesirable effects of the usual modulated-oscillator arrangement are completely eliminated. With the selector switch to the CW position, external modulation may be applied via the A.F. output terminal and its depth adjusted by the 400 c.p.s. voltage control.

Attenuator : The switched sections multiply the setting of the variable control by X1, X10, X100, X1,000 and X10,000.

Shielding : The metal cabinet is substantially made in steel and aluminium, all corners are folded and welded. The R.F. oscillator is double screened.

Controls : Seven controls are fitted : 1. Tuning ; 2. Audio voltage control ; 3. Fine attenuator ; 4. Coarse attenuator ; 5. Output selector switch ; 6. Range switch ; 7. Mains on/off switch.

Output Terminals : Two are provided, one for R.F. and the other for A.F.

The instrument costs £9 9s., and is guaranteed for 12 months.

Homelab Instruments,
374, High Road, E.11

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