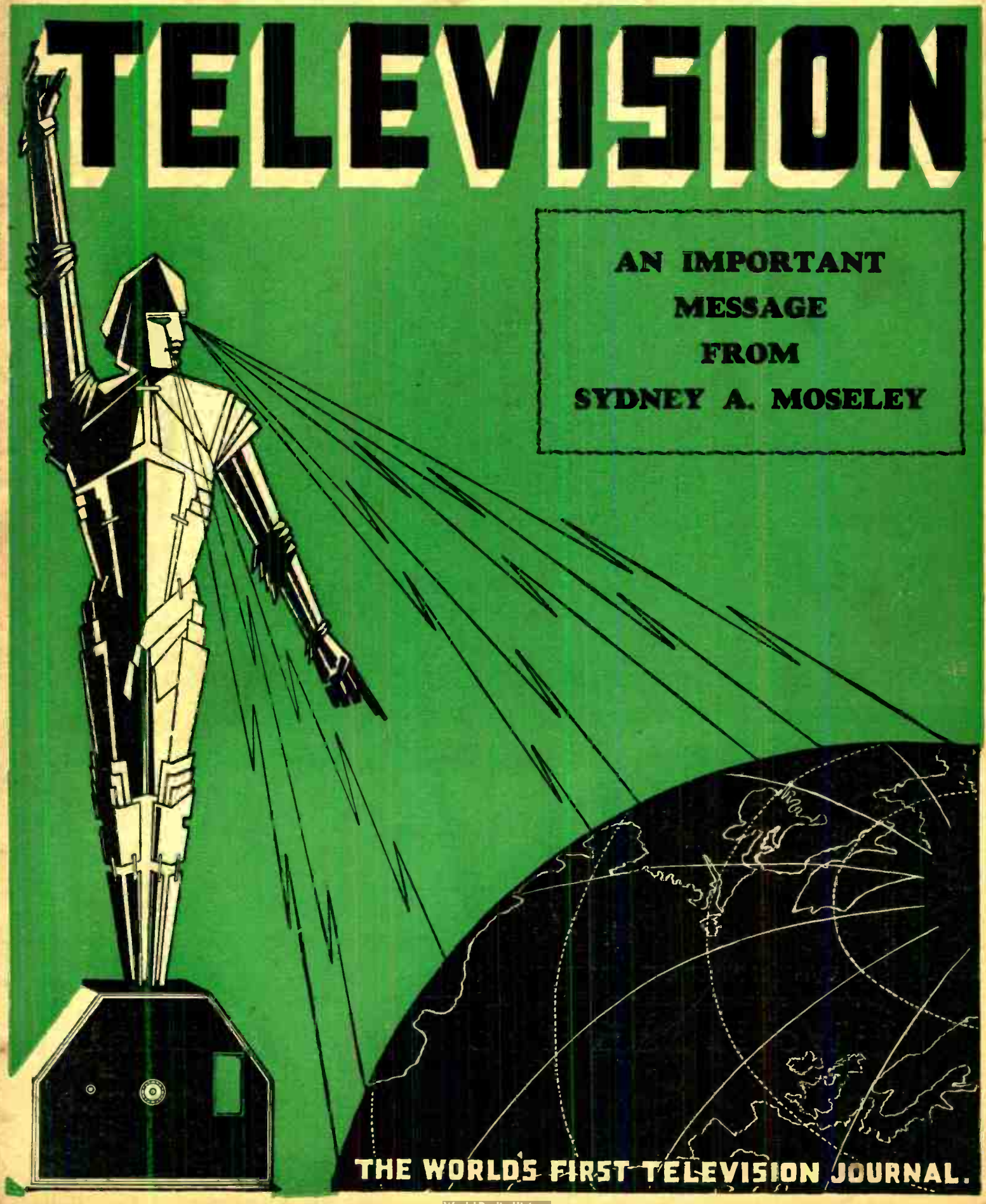
Vol. 5 MAY 1932 No. 51 ONE SHILLING MONTHLY

TELEVISION



AN IMPORTANT MESSAGE FROM SYDNEY A. MOSELEY

THE WORLD'S FIRST TELEVISION JOURNAL.

TELEVISION

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TELEVISION

THE
OFFICIAL ORGAN OF
THE TELEVISION SOCIETY

SYDNEY A. MOSELEY, *Managing Editor.*

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W. J. JARRARD, B.Sc., A.R.C.S., A.I.C.

VOL. V] MAY 1932 [No. 51

Sydney A. Moseley

to

Our Readers

FOR three and a half years I have voiced the message of television—British television particularly—through these pages, first as a contributor and then as Managing Editor. Much of the information contained in these columns was of world-wide importance and, indeed, gave a clue to forthcoming important events even in that "hive of industry" New York.

TELEVISION in fact is widely read in the United States.

* * * * *

In launching this magazine upon a sceptical world, the original Directors took a chance which more experienced journalists would have been more reluctant to take.

Their attitude may be summed up in these terms: "Television in our view is coming, therefore we shall be first in the field. At the same time we shall be in the position of being able to trumpet abroad our activities even though the rest of the journalistic world disdain to hear our message!"

* * * * *

That early propaganda, costly as it was, has justified itself to a large extent. This little magazine was able to penetrate corners where other newspapers and periodicals would have failed to reach.

Well, the situation has changed very largely.

Scepticism has given place to belief, and hostility has given way to sympathy.

Television has indeed arrived!

* * * * *

It therefore becomes necessary for a larger organisation than at present exists to deal with this fast-growing proposition. TELEVISION is no longer a mere infant. It has reached the giant stage and requires a giant organisation.

I am therefore exceedingly happy to announce that, beginning with the next issue, the famous firm of Benn Brothers will be responsible for the production and conduct of TELEVISION.

* * *

Benn Brothers need no bouquets from me. I have had occasional dealings with them for a good many years now, and as a boy remember the beneficent founder, Sir John Benn, and later had a pleasant interlude with the present head, Sir Ernest Benn.

Now young John Benn, who has exhibited a keen interest in television for some years past, and more than justifies the phrase "a chip of the old block," will take active control of TELEVISION.

* * *

Let me continue my confidences to my readers to the last! It was my suggestion to young John Benn that he should handle the magazine, and it was he who made the arrangements with his Board of Directors for taking it over. In doing so he justifies the many expressions of confidence he has made to me in the past few years.

* * * * *

The magazine under the new auspices will not only have a better chance, for, as I say, we were restricted in many ways, but it will also give a large number of readers who have been unable to obtain a copy of the magazine regularly, an opportunity of remedying this.

So you see that in this valedictory message to my readers I appear before them in a white sheet! An unusual rôle, indeed. Much I might have done has been left undone! The developments I should have liked to have given readers were not always possible even had I the time to pursue them! And so on . . .

Mr. Sydney A. Moseley, who has an important message to give to readers.

* * *

The future holds forth the brightest prospects for the consummation of many of the plans which I conceived but, for a variety of reasons, was unable to put into execution. Needless to say, I shall not lose touch with my readers altogether.

When the opportunity permits be sure I shall allow myself to be heard again, but, at any rate, be certain of this, I shall be the most consistent reader of the magazine under the new auspices. See to it that all of you are!

From My Notebook

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

Radio's £30,000,000 Trade Last Year

STRIKING testimony to the vitality of Britain's newest industry is provided by the review of the radio business in 1931, recently published by the wireless trade journal, the *Wireless and Gramophone Trader.*

The statistics supplied show that the gross turnover advanced by 50 per cent. during the year, the figure for 1930 of £20,000,000 yielding to one of £29,750,000 last year.

The figures are compiled with the co-operation of the General Post Office, which records the issue of listeners' licences, and of manufacturers, who provided details of their own production.

The Post Office figures show that 900,000 new licences were issued during the year; while the statistical survey in question discloses that of a total of 1,250,000 receivers sold during the period, 600,000 were bought by new listeners, while 650,000 were sold as replacements to existing owners, the balance being made up of "reformed pirates," home constructors, and users of coupon gift sets.

A market for not less than 1,800,000 new sets is forecast for the present year, and it is clearly demonstrated that radio, with only half of the potential market yet filled, can look forward to still greater progress in 1932.

Wireless is International

During the course of some very interesting reading the other day (yes, strange as it may seem, writers do read quite a lot), I came across several important facts which emphasised how wireless, both in theory and practice, must be regarded from an international aspect. I was intrigued most with what our friends in the United States are doing, and although the American design is gaining a greater influence in Europe, it must not be imagined that all new ideas in radio come from across the water.

America has certainly done a great deal to popularise radio and to adapt new ideas to mass production, but the fundamental ideas have almost invariably come from Europe. For example, the screened grid and pentode valves were both European inventions, and were first industrially exploited in England.

Design Basis

The design of the up-to-date American receiver is based on three main points:

1. Chain broadcasting on the medium waveband only.

2. Public demand for a self-contained set which at the same time has to be part of the furniture of the room in which it is used.

Another view of Mr. Ware's apparatus, to which reference is made in the Enthusiast series. He suggests the name of "Teleradiogramophone" for the equipment, the radiogram attachment being on the floor.

3. Public demand for an all-electric set in accordance with the general American slogan "electrification."

Without exception all American receivers are fitted with moving-coil speakers which can work and require much greater amounts of energy than the moving-iron type. An undistorted output of 2,500 milliwatts is quite a usual average for a modern

American receiver. To obtain this high undistorted output from the small aerials used in the crowded cities of the East and Middle West, the receiver must have very high amplification which, on the other hand, results in a high noise level caused by the amplification of "statics" and "tube noises."

Using the Pentode

The American receiver has invariably one L.F. stage only, either single or push-pull. Last year the L.F. stage incorporated a three-electrode power valve with low impedance, but this year the bulk of the sets have changed to pentodes. Although the pentode is much more sensitive than the triode, the greater part of the amplification must still come from the H.F. stages. Two or three H.F. stages with three or more tuned circuits are therefore the rule. The economic design of this circuit arrangement was only made possible by the exclusive use of screened-grid valves. All tuning condensers are ganged, and numerous ingenious arrangements have been devised to ensure perfect ganging and uniformity over the whole tuning range.

Previously trimmer condensers were used to adjust the individual tuning condensers, but now the adjustments are carried out by bending the outer moving vane of the particular condenser, which has three or four radial cuts to facilitate the adjustment. This simple procedure has quite the same effect as the use of separate trimmer condensers, and at the same time means, of course, a saving in production costs.

Reaction

Capacitive or inductive reaction, as almost universally adopted in European receivers, is entirely unknown in American sets. This, together with careful design of the aerial coupling circuit, reduces the possibility of interference between neighbouring receivers by radiating oscillations to a minimum.

Another vital difference between American and European design is the method of volume control. The possibility of controlling the volume of a receiver by varying the grid bias applied to the H.F. valve was, of course, well known in Europe, but as far as I know, never used in a commercially produced receiver. The main reason for America adopting this method universally is probably the ease with which it lends itself to automatic control, and not any particular advantage over our methods.

Automatic volume control is carried out by automatically varying the grid bias on one or more of the H.F. valves in sympathy with the strength of the received signal. A number of resistances are connected in series with the grid-bias resistance which defines the minimum bias for the screened-grid valve. Through the resistances flows the anode current of the detector valve or of a separate volume-control valve.

On the previous page striking testimony was furnished indicating the prosperity of the radio industry. This is due in no small measure to the care taken in testing out every component, a course of action following on the lines which have been adopted by the older electrical industry, one phase of which is illustrated.

How it Works

If the detector valve is used to control the volume it must work as a two-electrode detector; that is to say, it acts as rectifier only, but does not amplify the rectified signals. Usually the amplification of the H.F. stages is sufficient to pass signals on to the power stage without detector amplification, but in some receivers a dual detector stage is incorporated, the two detector valves being so connected that one acts as a two-electrode rectifier and automatic volume-control valve, and the second one as L.F. amplifier for the rectified signals. As this arrangement

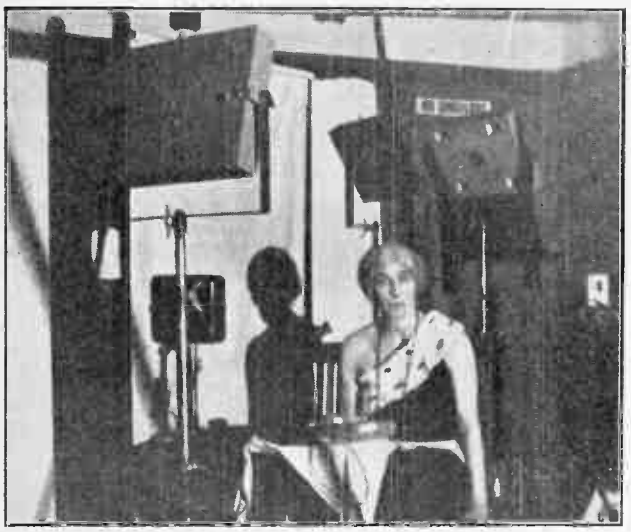
means, however, an additional valve, it is usually preferred to let the detector work in its conventional circuit and to use a separate volume-control valve, the grid of which is capacitively coupled to the output from the last H.F. stage.

When a signal is tuned-in on the receiver, anode current will flow in the two-electrode detector, or in the volume-control valve, and this current flows through the resistances connected in series with the grid-bias resistance, and the voltage drop across these resistances is added to the normal grid bias of the H.F. valves. On very weak signals only a relatively small current flows through the detector-rectifier (or automatic volume-control valve), and the voltage drop across the resistances is small.

On very strong signals, however, an appreciable current flows through the detector rectifier, causing a larger voltage drop across the resistances, which is then added to the normal grid bias of the H.F. valves. This will move the working point on the characteristic of the valves towards the lower bend, thereby reducing the amplification of the H.F. stages and the input to the detector stage. Variations in signal strength thus cause a continuous change in the amplification gain, so that practically a constant loud-speaker output is maintained.

A Disadvantage

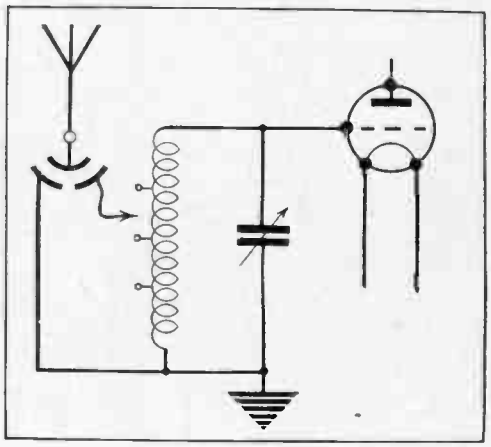
Automatic volume control is sometimes known in America as a "fading compensator," because it obviously tends to compensate the fading effect of distant stations as long as the pick-up from the station does not fall below the maximum sensitivity of the receiver.



Rather a novel feature introduced into the Baird television programme recently was a short sketch entitled, "In a Star's Dressing Room." Miss Janet Barrow is here shown in the studio ready for the transmission.

A disadvantage of automatic volume control is the difficulty of tuning a powerful station exactly to resonance, because the volume control flattens the output so that there is a uniform volume over a comparatively wide area, and it is hard to judge where the peak should be by merely listening to the loud speaker. On the other hand, it is most essential to tune exactly to resonance with modern efficient band-pass filter circuits, because the slightest deviation from resonance means loss of side bands and quality. To overcome this difficulty most sets employing automatic volume control are fitted with a visual resonance indicator in the form of a milli-ammeter showing the anode current of one of the automatically biased H.F. valves. For resonance this current will, of course, be a minimum. The tuning meter is mounted in a reverse position, so that the maximum deflection of the needle indicates minimum current and resonance point.

Showing how a differential condenser can be joined on the aerial side to act as a volume control.



Lately, several manufacturers have replaced the tuning meter by the so-called "tune-a-lite" device which consists of a narrow strip of reddish light, the maximum height of which indicates resonance. Combined with this neon light is a special switch which cuts out the speaker during tuning so that the objectionable noise between stations can be avoided.

Easy Volume Control

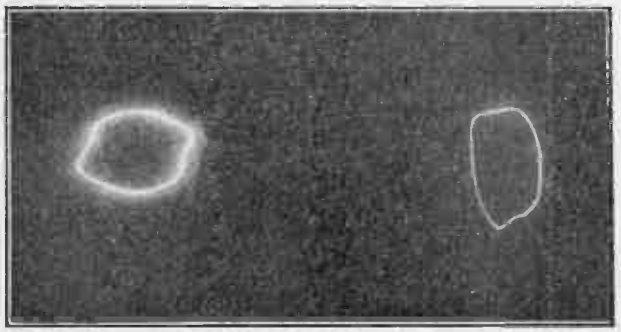
There is one form of volume control and selectivity device which many people seem to overlook when building up their wireless sets. I refer particularly to the use of a differential condenser on the aerial side, as shown in the accompanying sketch.

The moving plates are joined to the aerial lead-in and one set of fixed plates to the earth end of the aerial coil, the remaining set of fixed plates passing to a coil tap.

In this way the capacity variation provides a very simple but most effective and smooth volume control, the "throttling" of the signals taking place at what many regard as the best position, namely before passing into the set. Selectivity is improved as well, and for many purposes the arrangement shown is to be preferred to the straightforward series aerial condenser, either of the fixed or pre-set type.

Progress in Cathode-ray Tube Design

WITHIN the last few years the cathode-ray tube has been used extensively as a measuring instrument, and has become of great interest to physicists and engineers in view of its suggested application to television reception.

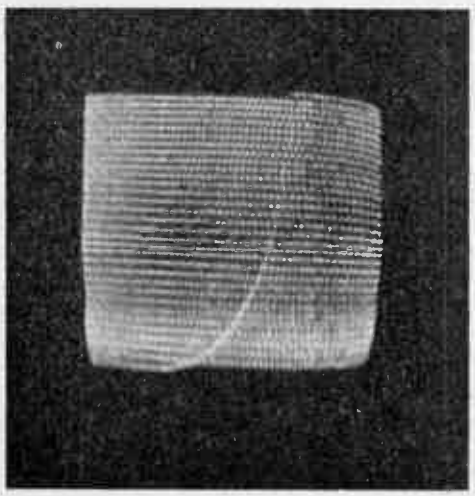


A.—The marked difference in sharpness between "spot-tracings" with old and new tubes.

It is the purpose of this article, therefore, briefly to present certain improvements in detail which have been effected recently, the general principles underlying this work having already been published.[1]

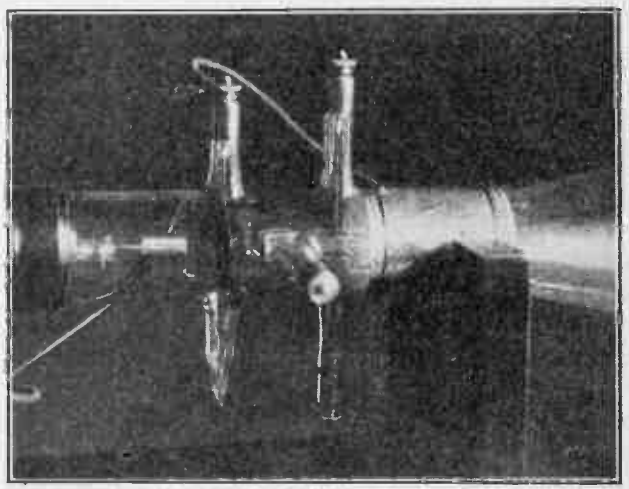
New Cathodes

Since the introduction of A.C. heating for the filament and the development of accessory apparatus, the tube has, to a certain extent, established its position as a scientific instrument, but the main problem has remained, namely that of increasing its precision. While the tube was used for demonstrations only, the degree of definition of the fluorescent spot was not of great importance. For precision measurement and for television however, this is of the utmost importance. Theoretical investigation, together with manufacturing experience, indicates that the sharpness of the spot depends mainly on the cathode.



B.—Parasitic oscillations produce this effect in a line-pattern screen.

A means has been found of improving this without reducing the area from which emission takes place, and without reducing the useful life of the tube. *A* shows the marked difference between the old and new type cathodes, and the right-hand figure shows that the cathode-ray tube can yield well-defined oscillograms.



C.—An earthed metal shield for eliminating disturbing oscillations.

Parasitic Oscillations

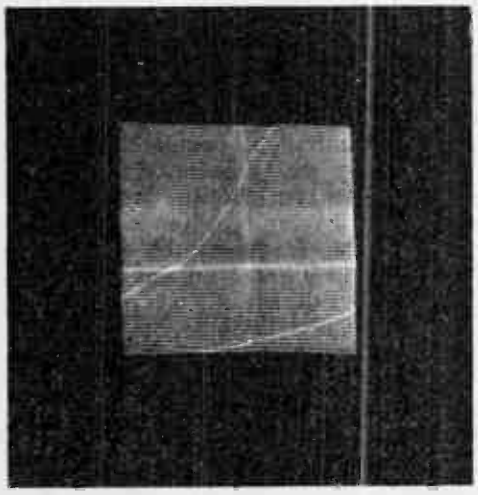
Certain faults common to all gas-filled tubes are specially noticeable with the new tubes. When operated with anode voltages above 2,000, certain parasitic oscillations may be generated, the frequency of which is definite and only slightly affected by the gas pressure and emission current. This frequency is of the order of 50,000 cycles, and the ray behaves as though it were modulated at this frequency. The amplitude of these oscillations is very small, but with a very sharp spot they are noticeable. *B* shows the effect of these oscillations in a line-pattern grid, where the speed along the line is about 100 mm. per second.

[1] M. v. Ardenne: "Untersuchungen an Braunschen Rohren mit gasfullung," *Zeitschr. f. Hochf. tech.*, January 1932, vol. 39.

These disturbing oscillations can be eliminated easily by surrounding the tubes by earthed metal shields, as shown in *C*, and the improvement resulting from this modification is shown in *D*.

Definition

The definition of the spot is not so good when the frequency approaches a million cycles. *E* illustrates this effect. The line on the left is due to a 50-cycle wave, and that on the right to one of a million cycles of approximately equal amplitude. It is noticeable that the centre of the trace, at which the velocity is at a maximum, is particularly blurred. It has been found that by using a gas-filling having a smaller molecular weight, the frequency limit is increased about four times as compared with the Argon-filled tubes. With tubes of this type, a perfectly sharp trace has been obtained with a length of 5 cm. at a frequency of a million cycles.



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D.— The pattern improvement after earthing screens have been included.

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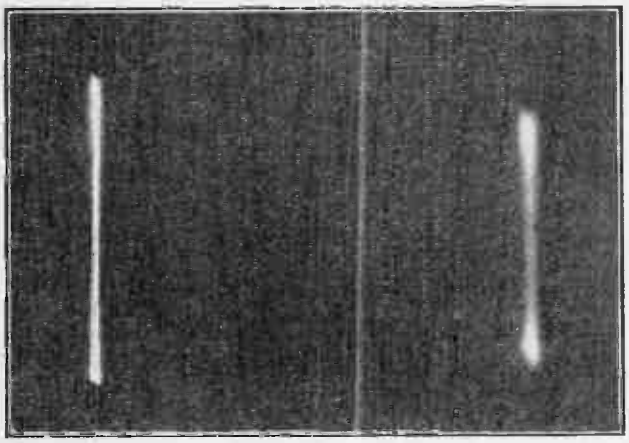


E.—Differences in spot definition. That on the left is for a 50-cycle wave and that on the right for a million-cycle wave.

This represents a great advance for high-frequency measurement, but is not of great significance for television work, as the scanning velocity is not likely to exceed 100 mm. per second.

(From W. Edwards & Co.)

The "Visionette"

By *William J. Richardson*

(Concluded from April issue)

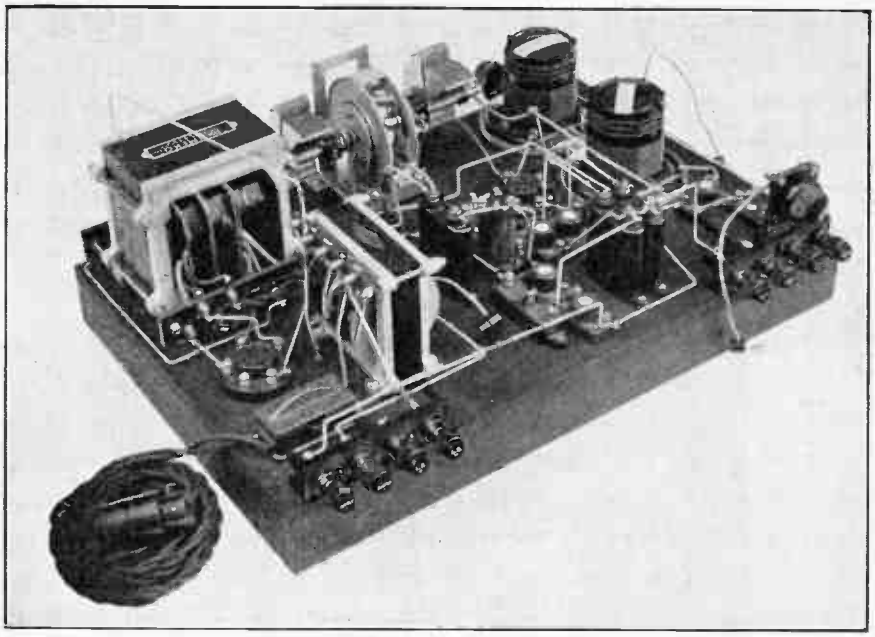
IT was unfortunate that pressure on editorial space last month prevented the inclusion of the constructional and operating side of the "Visionette," but the lapse of time will have enabled prospective constructors to get together all the components which were listed.

Cabinet and Baseboard

The cabinet and baseboard have been made up specially to my specification by Messrs. Peto-Scott & Co., Ltd. Since the twin-gang condenser will seat itself on the baseboard and, apart from the wave-change switch knob is the only control which has to be operated, it was decided to dispense with the panel altogether.

All the components can be mounted above and below the baseboard supplied by the company mentioned. It consists of a $\frac{3}{8}$-in. plywood base, 18 in. by 12 in. by $\frac{3}{8}$ in., secured to three battens, two of which run underneath the side edges and one at the back. This raises the underside of the baseboard $1\frac{5}{8}$ in., and enables certain of the components to be mounted very conveniently underneath, so as not to cramp the lay-out above baseboard.

Furthermore, the very handsome oak cabinet made to accommodate the "Visionette" receiver has a solid oak front with a central cut-out to take the moulded "dial" of the Formo condenser. In this way the set can slide in from the back and be held in place with screws, and on clipping home the back provided, the set is housed in a dust-proof cabinet with a most prepossessing appearance.



Readers will agree after examining this photograph, taken from the back of the set, that the "Visionette" is very neat and compact.

A Slight Aerial Modification

A reference to the wiring diagrams of Figs. 3 and 4, and the accompanying illustration will enable the constructor to mount all his components exactly in position. Fig. 1 is the theoretical diagram of the set which was given last month, and is included again to save readers having to refer to the April issue, while in Fig. 2, is shown the very slight alteration that has been effected on the aerial side. The original fixed condenser C_1 of ·0001 mfd. capacity has been replaced by a Polar differential condenser of ·0001 mfd. capacity.

This course was decided upon after tests carried out close to the Brookman's Park station, and serves the double purpose of a volume control and selectivity device. The moving plates of this condenser (which by the way is mounted conveniently on a small right-angled bracket as shown in the illustrations), are connected to the aerial 1 terminal. One set of fixed plates now joins the terminal 1 of the aerial coil and the other set passes to a short length of flex terminating in a Belling-Lee spade connector marked "earth."

With the spade connector left free, the condenser functions as an ordinary series aerial feed condenser, and when the spade connector is clipped on to the earth terminal we have the condenser working as an effective volume control by regulating the signal feed into the coil L_1. This scheme, together with the alternative pair of aerial fixed condensers, C_2 and C_3 of ·0002 mfd. and ·005 mfd. capacity respectively,

should meet the various conditions of selectivity required when the set is in use.

Fixing the Gang Condenser

The wiring diagrams are drawn to scale, and on a small metal strip passing across the framework and resting on the aluminium base.

Pay very careful attention to the positioning of the pair of Colvern coils. The aluminium bases must be included and the coils so aligned that the wave-change switch rod is at right angles to the

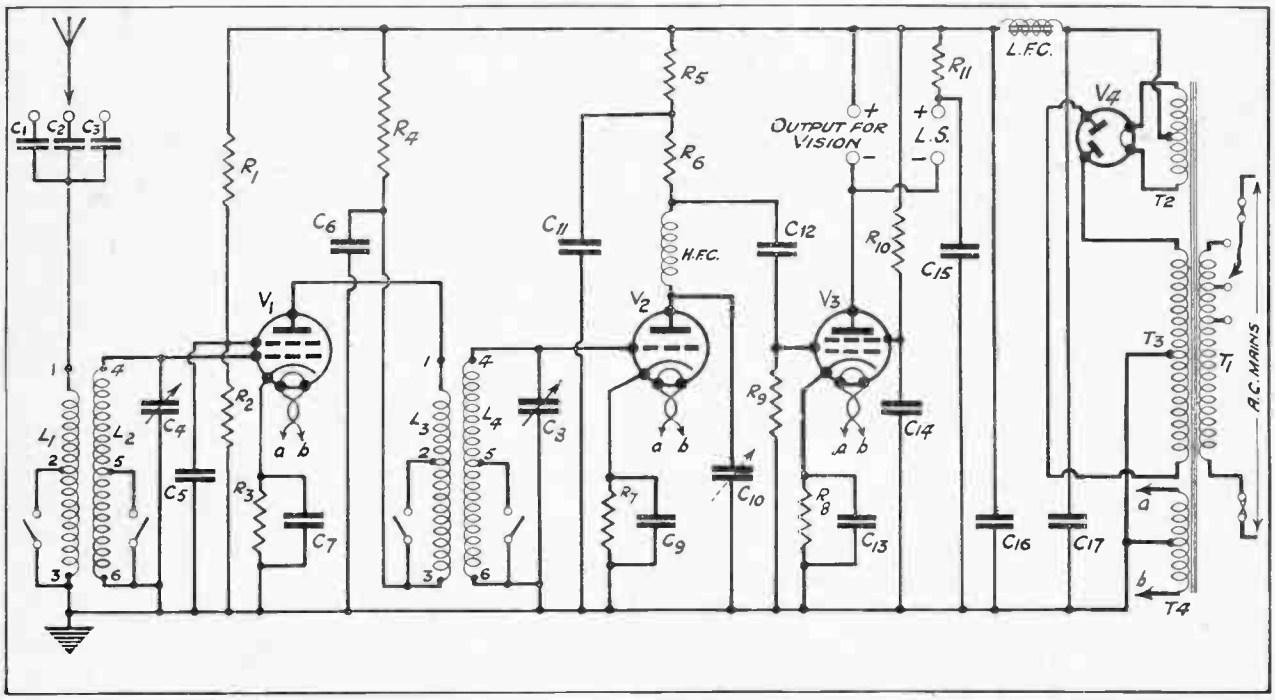


Fig. 1.—The circuit diagram of the "Visionette" receiver reproduced again from last month's issue. A careful comparison should be made with this circuit and the wiring diagrams, all the component lettering corresponding.

although reduced in size ensure that the exact location of each item can be undertaken. Be very careful indeed to place the variable condenser exactly in the centre of the baseboard at the front. Since ultimately this condenser will be held rigid by the four screws passing right through the central cut-out in the cabinet front, it can be held down on the baseboard by a screw on either side of its bottom framework, the top of each screw exerting pressure

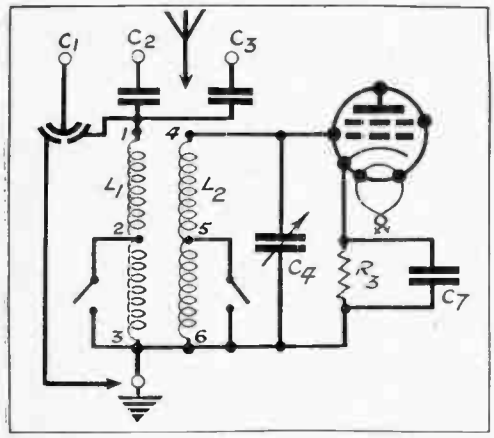


Fig. 2.—Here we see the slight modification which has been made on the aerial side.

baseboard edge, and use must be made of the link to "gang" the switching of the coils and enable both to be switched from one knob movement.

Proper Precautions

Since there are several Watmel wire-wound resistances used in the set, it is necessary to ensure that the right ones are included in their proper positions. In addition, note that the Dubilier grid-leak holder is a vertical one and not the horizontal

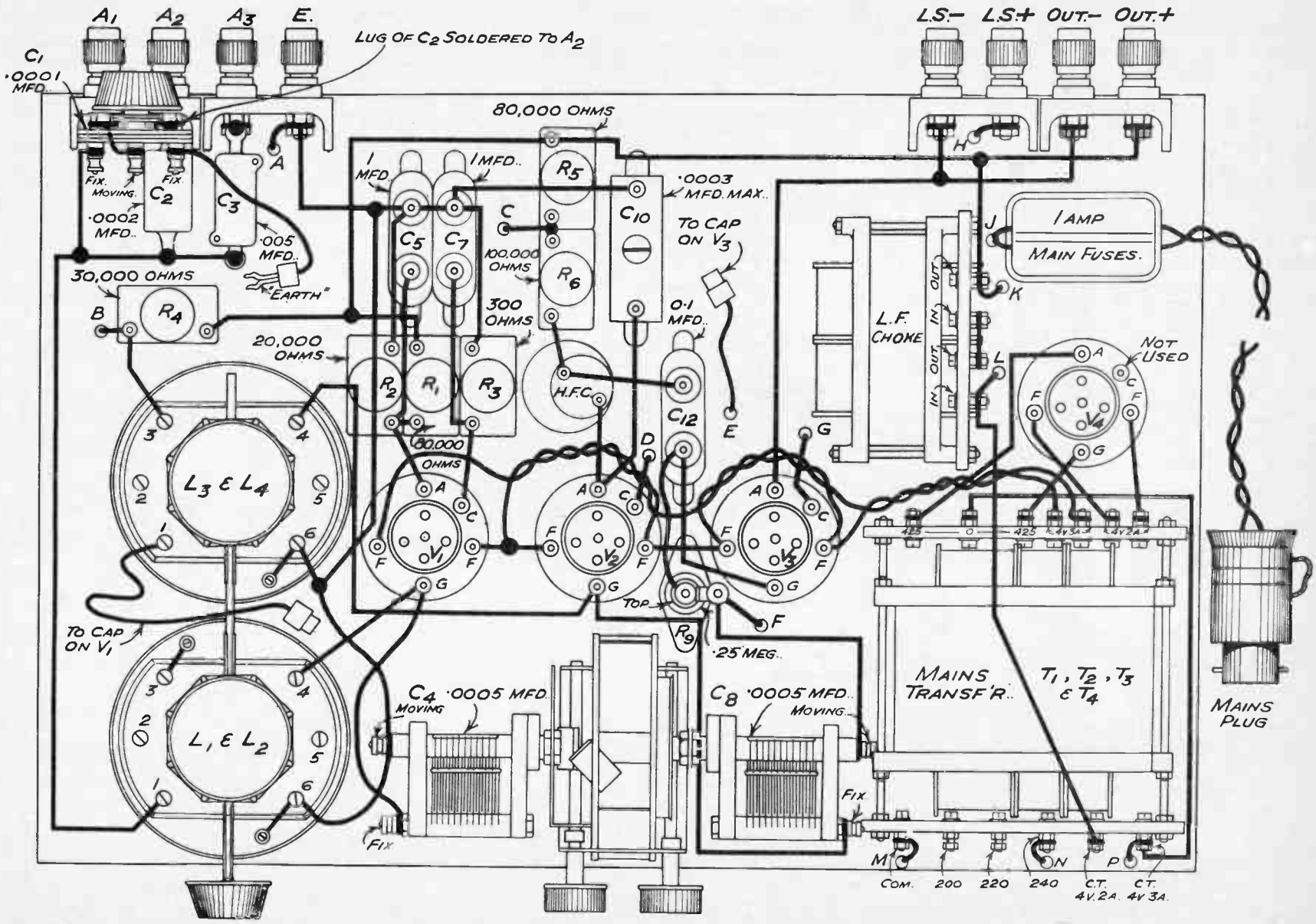


Fig. 3.—All the "above baseboard" wiring is shown in this diagram. Where holes are made in the baseboard for wires to pass through, a letter is included, and the wiring run is completed by referring to Fig. 4 on page 109.

component. This course was adopted owing to the small amount of space available near the grid of the pentode valve, and also because of the possibility of fouling the moving plates of the variable condenser during tuning operations.

In addition, on test it has been found that a 0·5-megohm grid leak is preferable to the 1·0-megohm value specified in the original list of components.

Since the components are held in place both above and below the baseboard, it is incumbent upon the constructor to see that when holes are drilled in the baseboard to allow wires to pass through, the drill itself must clear the components and not cause damage.

Wiring

It will be noticed that the fixed condensers below the baseboard are held against the side battens except in the case of two. For this pair, aluminium straps were made to pass round each condenser case, two screws passing into the baseboard to secure them in position.

The next task to be undertaken is the wiring, and I should like here to give one or two words of advice. First of all wire up the filament connections of the valves. For this purpose I employed good-quality Lewcos twin flex, it being borne in mind that each valve requires a current of one ampere. Tuck the flex round the valve holders as indicated, keeping it on the baseboard since it carries raw A.C.

The Best Wire

I have used soldering tags at each connecting point, these being properly tinned. An electric soldering iron is very convenient and efficient for this class of wiring work, and I strongly recommend this policy to anyone who has not yet tried it.

Where possible keep all the leads short and straight with neat right-angled bends. Lewcos No. 16 Glazite wire is what I always favour, although No. 18 gauge will do quite as well. The two fixed condensers, C_2 and C_3, are soldered direct to the aerial terminal tags. When making connections to the pair of coils, remember that screening covers have to be put on, and the wires passing from the numbered terminals must be positioned to keep central with the slots in the covers.

Follow the Plans

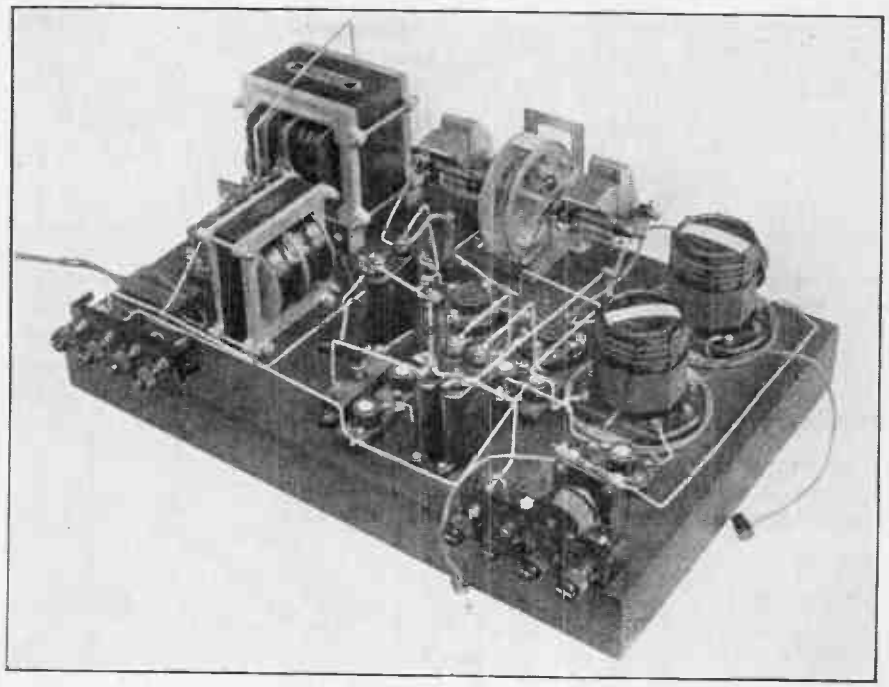
It is advisable to keep strictly to the wiring runs shown in the two diagrams and portrayed in perspective in the photographs. In this way there is less likelihood of any mistakes being made.

Two Belling-Lee S.G. anode connectors serve to make connections to the terminal at the top of the S.G. valve and the terminal at the side of the pentode valve. This is preferable to bare wire, for when removing valves no bare ends of live wires will be inside the set, with the likelihood of causing damage.

In addition to using a short length of flex to the top cap of the vertical grid-leak holder, use flex wire to the two terminals on the left-hand condenser of the twin gang. This condenser has an adjustment to move its fixed plates through an angle of about 30 degrees, and if the connections are made with solid wire, movement, and hence the trimming adjustment, is prevented.

Do not fail to include the earth wires to each of the metal coil bases. The short lengths for this

(*Continued on page* 109)



The "Visionette" minus its valves and coil-screening covers. The positioning of the differential condenser just above the aerial terminals is seen clearly, while the "perspective" wiring runs can be followed easily.

A New Crater-tube Development

IN the present state of the television art, one of the necessities for certain work is a point source of light of good modulation capability. Such a tube is required in many of the models of "projection-type" apparatus, and various methods have been employed in achieving the desired "point source." In some lamps the light available is limited by a shield placed within the tube, which is pierced

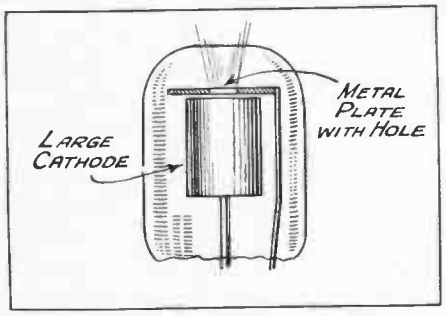


Fig. 1.—In ordinary crater tubes the light emitted is limited by a shield as shown in the sketch.

by a minute hole of the desired dimensions—the size being governed by the characteristics of the optical system to be employed. Fig. 1 shows a lamp of this type in cross-section.

Ordinary Crater Tube

In Fig. 2 there appears a method evolved in the attempt to achieve a lamp of improved modulation characteristics. The "crater" takes the form of a

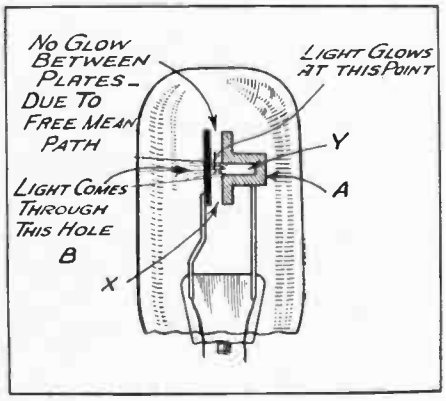


Fig. 2 — A sectional view of another type of crater tube somewhat on the lines of the illustration on the next page.

hole in a metallic plate *A*. The plate *B* contains a hole or aperture of a size determined by the optical system to be used. By a correct relationship between the distance separating *A* and *B* and the pressure of the gas with which the tube is filled, it is possible to achieve a condition wherein the space between the two plates is within the Crooke's "dark space," so that no discharge will form in that area. The portion of the crater outside the "dark space" will determine the position of the discharge formed. That is to say, the discharge will not occur at *X*, as might be supposed, but at *Y*.

An exceedingly efficient source of light could be attained if the discharge could be brought out to the front of the aperture plate or "anode" (*B*) in the form of a ball, and maintained at that point, when the total amount of light available to the optical system would be tremendously increased. Not only this, but the modulation capability of the tube, particularly at the higher frequencies, would be improved.

Here we see the flat-plate neon lamp mounted on a bracket for working in conjunction with a disc to produce television images.

Another Design

To accomplish this result the design of a tube of the general structure indicated in Fig. 3, and of the form shown complete in Fig. 4, has been evolved. Such a tube is stated to have a true "crater" source of light, as the entire light available is concentrated to a point or "ball." This is largely outside the hole in the anode, with the ionised gas coming from the cathode within the tube, a design method of both electrical and mechanical novelty. Both the type of gas used and the pressure must be controlled carefully, if the desired result is to be obtained.

. The hole in the cathode is about ·07 in. in diameter and about ¼ in. deep—the ratio of width to depth being about 8 to 1. Under these conditions full advantage of the theoretical possibilities may be taken and the true point-source obtained.

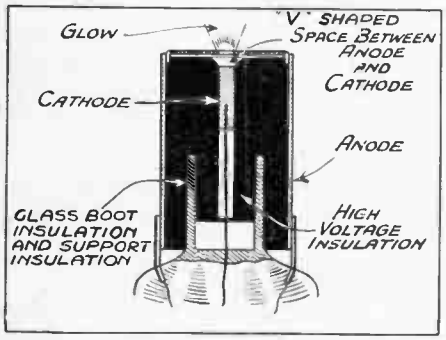


Fig. 3.—A newly developed crater tube, in which the glow is brought out in front of the anode cylinder.

"Cleaning-up" Gas Impurities

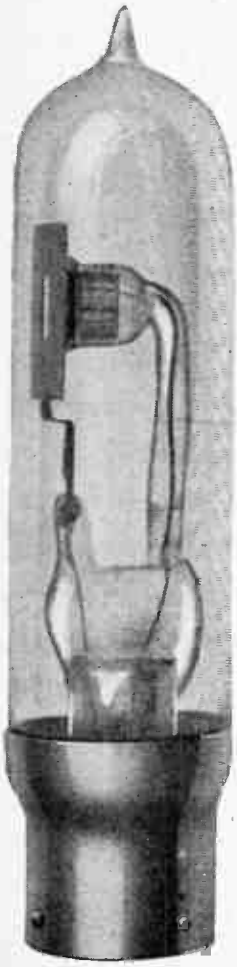
The cathode may be made in whole or in part from one of the alkali metals, in order that the advantage of lower striking potential may be achieved. Certain of these metals have the added advantage of cleaning up the gas impurities as well. This latter feature is important if long life and uniform operation are to be obtained.

By using such metals as beryllium and magnesium, a good clean-up of impurities may be achieved. After several hundred hours such tubes still show good characteristics.

Contrary to general practice, the alkali metal cathode is not of such great mass as to prevent vaporisation—rather a slight evaporation of the metallic vapour is desired, so that the spectral lines of the discharge will contain not only the characteristics of the gas with which the tube is filled, but of the metal also.

Television images obtained with such a tube are of good brilliance and clarity.

(From *Television News*, April 1932.)



The crater type of neon lamp has been employed very successfully for television projection work. A mirror drum generally forms the medium for "throwing" the light beams on to some form of screen.

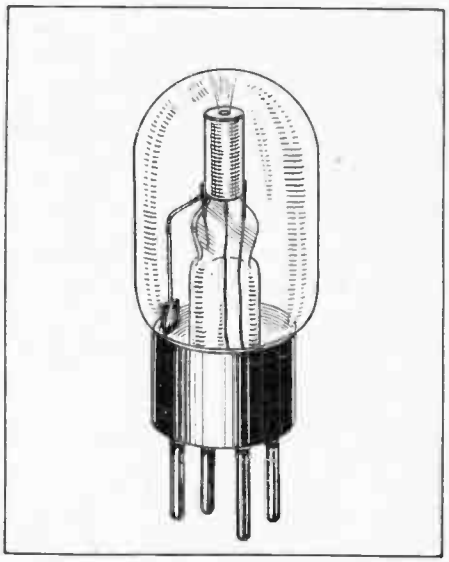


Fig. 4.—The type of tube described in the article. The main feature is a realisation of good brilliancy.

IMPORTANT NOTICE TO READERS

WITH the increasing interest which is being manifested in television developments and the growing numbers of amateurs who are conducting definite experiments in the science, we have had a very large number of queries sent in from readers who are seeking advice.

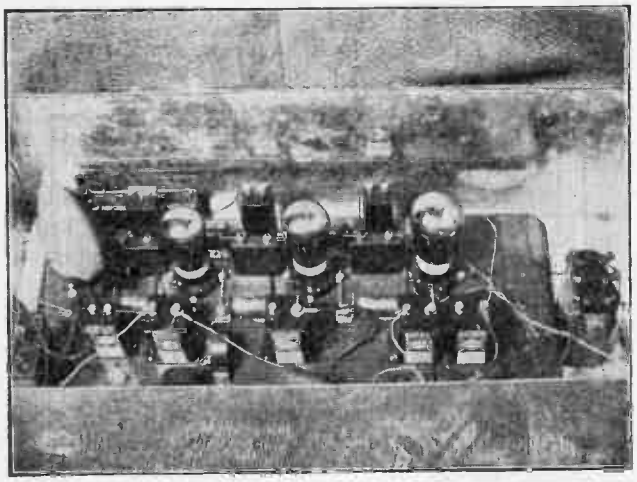
We have, therefore, inaugurated a query service for the benefit of these readers. Will they note that we shall be pleased to give advice on their problems, provided these are set out carefully and neatly on one side of the paper?

There will be a nominal charge of one shilling for this service, the number of queries to be answered for this sum not to exceed one. We cannot at the moment, however, undertake to supply blue prints, circuit diagrams, etc., in this service.

When space permits, we shall include one or two selected queries in our Editorial columns, so that others can reap the benefit of our advice.

The Enthusiast Sees it Through

HOW many readers realise that another birthday was celebrated recently? We refer particularly to March 31st, for it was on this day two years ago that the first dual transmission of vision and sound took place from the twin Brookman's Park transmitters. For six months or so prior to that date vision alone had been transmitted by the Baird Company, as the twin transmitters in question had not been completed. Readers have therefore had for two years this dual transmission on which to conduct experiments, and their work has borne fruit to such an extent that we have been able to maintain monthly this Enthusiast series, which has proved such a popular feature.

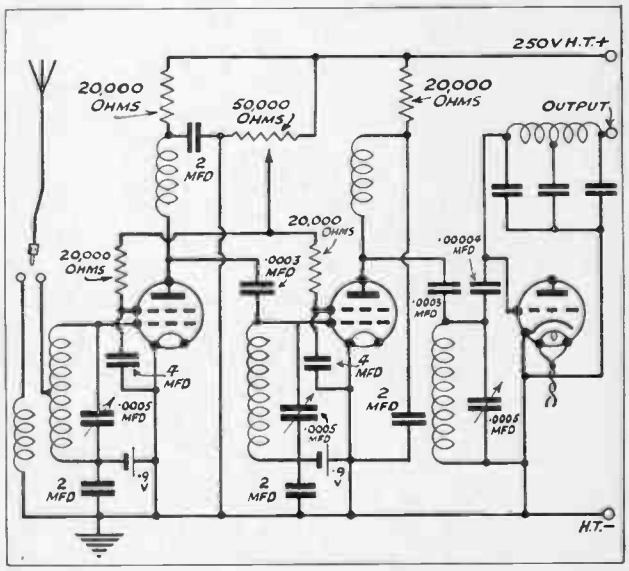


A photograph of the transmitting amplifier used by Mr. Kay in conjunction with his photo-electric cells.

With the promise of additional transmissions in the evenings from the studios at Broadcasting House, as mentioned in our last issue, we can look forward to a redoubling of our readers' efforts in their work, and we should like to take this opportunity of wishing them every success, and hope to record the results they obtain in our magazine.

Exceedingly Good Results

We feel sure that our readers will join with us in extending congratulations to Mr. A. E. Kay, of 62 Spotland Road, Rochdale, Lancashire, on the exceedingly good work he has undertaken in the reception of television images so far distant from the Brookman's Park transmitter. At the moment he has been successful in projecting these images on to a screen 7 in. by 3 in., by making use of the Kerr



The high-frequency and detector stages of the receiver used with such success in Rochdale, Lancashire.

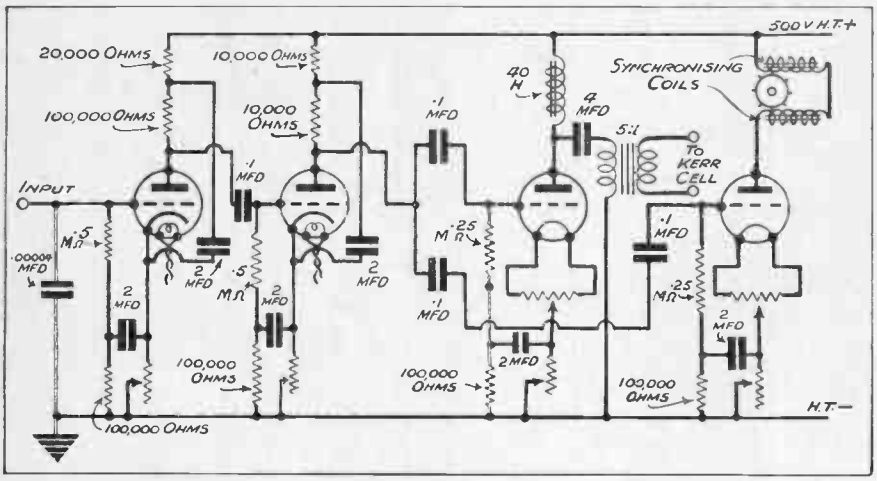
cell device. Mr. Kay regards the description of his apparatus in a form suitable for publication a much harder task than the reception of television images. During the course of his letter he says:

"Enclosed please find photographs of my latest television receiver; also one of my transmitting amplifiers. I have been promising you details of my equipment, but as I am not much good with the pen, it proves harder work writing about than building up my equipment. Herewith a description of the interior, which is photograph No. 1. The bottom shelf houses two mains units which supply H.T. of 200 volts and 500 volts, also 4 volts for filaments and 7·5 volts for the output valves; together with all the switching and necessary meters showing the total output of the combined H.T. The second shelf houses two screen-grid valves and anode-bend detector, the coupling being tuned grid.

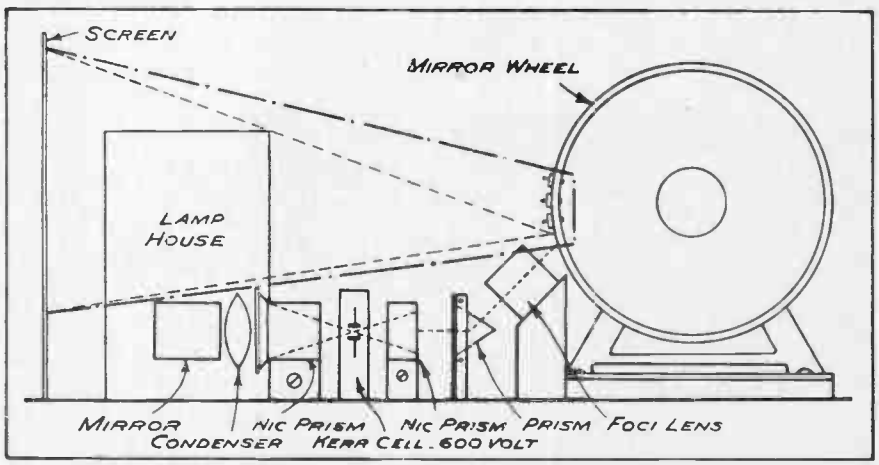
"Since the photograph was taken, a diode rectifier has been substituted for the anode detector. I do not think there are any further remarks with regard to this part of the equipment, so we will now move to the most interesting part, namely the top shelf. This houses a small projector lamp, Kerr cell, nicol prisms, and the low-frequency part of the amplifier, which consists of an AC/P, 104V., and two DO/20 valves resistance coupled; one of these DO/20 valves being used for synchronising, the other for operating the Kerr cell through transformers.

"Now for the optical system. The lamp house, which you will notice is situated behind the second valve, houses a small 12-volt cine. lamp, the light of which is turned through an angle of 45 degrees and then passes through the condenser seen held in position by a small clip on the square piece of metal just above the valve. It then passes through the polariser, which is between the first and second valves, then comes the Kerr cell, which is, incidentally, a small bottle with the top knocked off.

"You will notice this by the crocodile clip which makes connection so that it is easily removable. Then we come to the analyser, just visible behind the first valve. The light is turned upwards by an



On the low-frequency side we find a three-stage amplifier with individual output valves. One of these supplies the signals to the Kerr cell, while the other handles the synchronising signals.

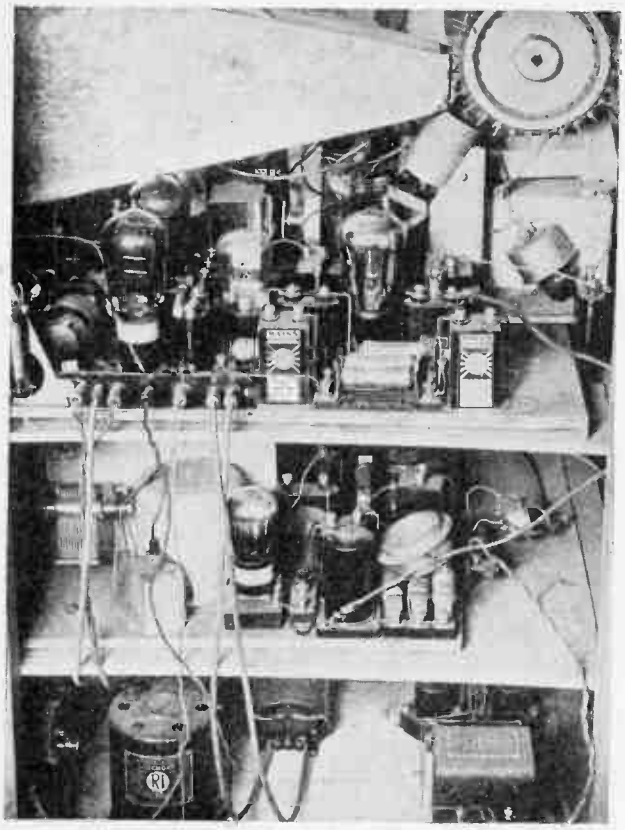


An elevation giving the rough lay-out of Mr. Kay's Kerr-cell vision apparatus. It projects the images on to the screen shown at the left.

ordinary prism, the angle being 60 degrees, and then passes through the focusing lenses on to the mirror wheel, from the mirror wheel on to the ground-glass screen, through the tunnel arrangement seen at the top of the photograph.

"The motor that drives the mirror wheel is a standard Baird machine, the mirror wheel being turned up on my lathe from a piece of maple. It was divided up into thirty with the aid of the synchronising wheel. The jig was then made, having two holes spaced $1\frac{1}{8}$ in., and this was used to drive the two holes for the screws to pass through that hold the mirrors at either side.

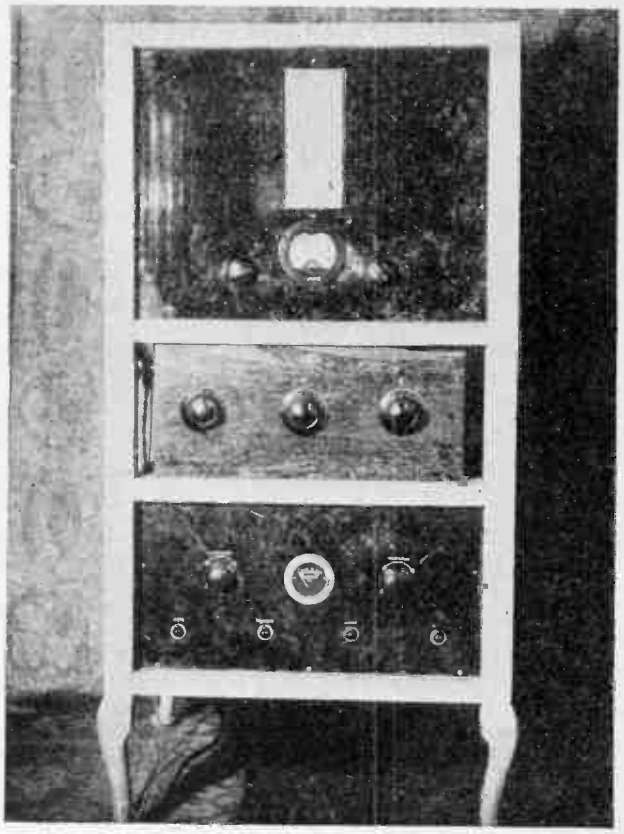
"There also had to be another twenty-nine holes drilled. These take small wood-screws for adjustment, so that each spot of light is exactly the same distance apart. The mirrors consist of silvered microscopic cover glasses fastened to small strips



The general lay-out of the wireless receiver and amplifiers used in conjunction with the Kerr-cell television receiver.

of aluminium. Photograph No. 2 gives a general appearance of front of set.

"I don't think I need comment on this, beyond the fact that the pictures are black and white, and are on the screen seen above the Ferranti meter, and measure 3 in. by 7 in. Each mirror gives a dot of



An outside view of the receiving apparatus with which Mr. Kay obtains a black-and-white picture on the screen at the top, although he is situated 200 miles from the station transmitting the Baird television signals.

light exactly one-tenth of an inch square, so that my screen is entirely filled. Photograph No. 3 is the photo-cell amplifier. This amplifies the output from three photo-electric cells when used for indoor transmission by the aid of the flying-spot system.

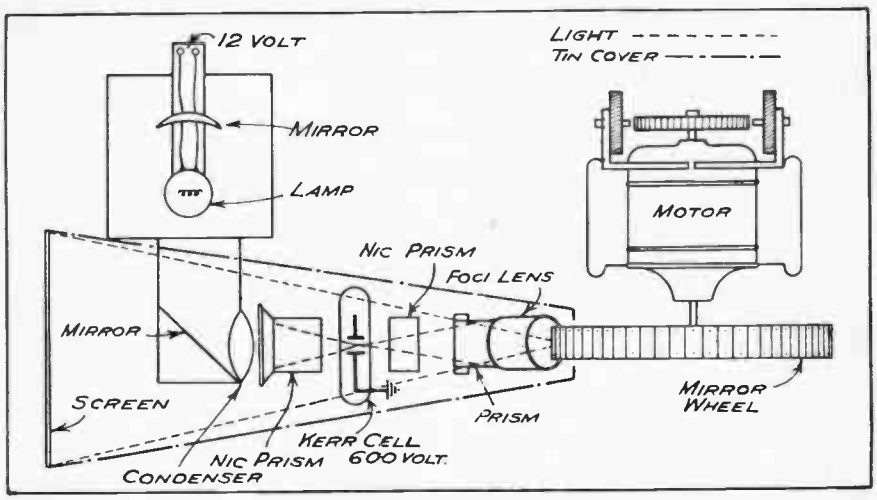
"I am able to get quite good results with head-and-shoulder views, but the best results so far obtained have been outside in strong sunlight. The object is then projected on to the disc, after which it is condensed on to the photo-electric cell. This equipment gives exceptionally good results, and the picture compares very favourably with those I receive from Brookman's Park.

"I shall be willing to demonstrate this apparatus to anyone who cares to call round at 11.30 a.m. I trust that this will constitute a record for television

reception; that is, a picture, black and white, on a screen 200 miles from the broadcasting station.

"Hoping you will be able to find space for this in your excellent journal, of which I have been a reader since No. 1 and am still as keen as ever."

readers will glean much useful information, and a comparison can be made with the circuit of Mr. Barton Chapple's Tele-Radio Receiver, and that supplied by our reader, Mr. E. H. Ware, of "The Beeches," Woodbury, Nr. Exeter.

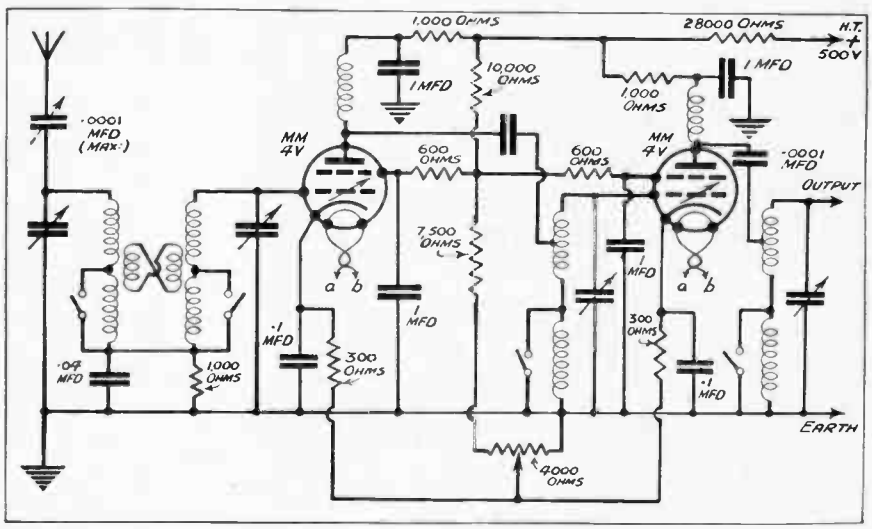


Showing a rough plan of Mr. Kay's apparatus. The positioning of the individual items is indicated, and this diagram should be used in conjunction with the text.

From Crystal Set to Television

Another reader since our first issue has at last furnished us with details of the extremely interesting work he is carrying out in connection with television experiments. In addition to

"Having completed nearly two years' active experimenting in television, I thought you would be interested in my results. At the outset of these experiments (in May 1930), I determined to give no demonstrations or descriptions of the apparatus until the results were up to the standard of those



In designing his wireless receiver for vision signals Mr. E. H. Ware has built up three distinct units, and the one shown here comprises the two high-frequency stages.

a very full report, together with circuit diagrams and photographs, which we print below, he has sent us a very amusing letter. In congratulating us on what he calls "our excellent paper," he points out that his interest in radio dates from a crystal set used in 1921. From this he graduated through "super-regeneratives" to "short-wavers," and thence to television early in 1930. Incidentally, although he has experienced most of the thrills that radio can give, he is emphatic in pointing out that television is the most fascinating of all.

In printing his report below, we are sure our

seen at the Baird Studios in Long Acre. This has now been accomplished, and I think you will agree that it has been no easy task, considering that we are over two hundred miles from Brookman's Park.

"The vision apparatus is made up from standard

(*Continued on page 112*)

Further Discussions on the Tele-Radio Receiver

By

H. J. Barton Chapple,

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

SINCE publishing last month the basic circuit which I have evolved for the Tele-Radio Receiver, I have been brought into touch with some interesting comments concerning the arrangement suggested.

Another version of an all-in vision set—this time from far-off Madeira, the constructor being Mr. W. L. Wraight.

For example, I learn that Mr. E. H. Ware, of Woodbury, near Exeter, has used successfully a receiver built up from a circuit very similar in character, and he has been rewarded with very good results after nearly two years' active experimenting. He has built his set up in unit form, and employs two high-frequency stages of variable-mu valves with a diode detector, followed by three stages of resistance-capacity coupling and an additional valve for synchronising.

Taken to Task

He takes me to task, however, for not favouring the inclusion of band-pass tuning, or a band-pass input filter. I maintain my original attitude, however, not for pedantic reasons, but solely because personal experiments and those conducted by colleagues of mine show that for distant working the band-pass scheme, as a whole, is not the best arrangement.

If each tuned circuit was made up as a band-pass, it would mean the ganging of *six* variable condensers, not to say anything about the extreme accuracy of the coil matching which is so essential if the scheme is not to fall to the ground. It is possible to have each of my tuned circuits *slightly* off tune, thus doing away with the sharpness of the resonance curves, and, indeed, it is this scheme which in the past has been productive of extremely good images in the various sets I have built up for television reception purposes.

In any case, I am following rather an unusual policy by taking readers into my confidence in the evolution of this special set, and I shall not fail to make known the snags which are sure to crop up, for in this way I shall hope to give such advice as will prevent others from coming up against the same difficulty.

More about the Diode

Since my last article I have had some correspondence with Mr. H. L. Kirke, of the B.B.C., and I should like here to place on record my ap-

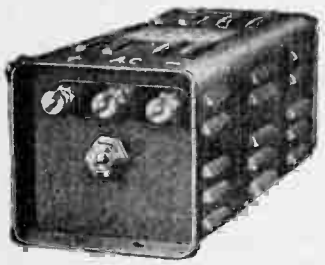
preciation of the very helpful advice he has given, especially when I know that Mr. Kirke is an extremely busy man and his leisure moments are few and far between.

During the course of his letter he suggests using an AC/HL as the diode valve, while the values of C_{13} and C_{14} (see last month's diagram on page 69) should be about ·00003 mfd. each. For the longer waves it may be desirable to increase the capacity value of C_{14} to prevent any radio-frequency currents from reaching the low-frequency valve.

Mr. A. S. Burton, of Queen's Road, Bridport, is justly proud of all the apparatus he has built up for his television experiments. He has been a reader of "the journal" since No. 1, and readers will recognise the first issue in this photograph.

Another point stressed was the importance of keeping down to an absolute minimum the stray capacities associated with the grid of V_3. These are the leads connecting the grid with the high-frequency choke and with C_{13}.

R_{10} is not a definite quantity and can be made anything from ·1 to ·5 megohm. The lower the resistance the greater can be the capacity of C_{14}, which is an advantage; but the lower the resistance the greater is the damping on the previous circuit, which may or may not be an advantage.



One sample of a Westinghouse metal rectifier. In the H.T.11 model the casing is made up from a metal mesh.

H.F. Choke Important

Another suggestion was that R_{11} can conveniently be 100 ohms, which value will drop one volt at 10 milliamperes. If the normal feed to the valve is very much less than 10 milliamperes, then the resistance should be increased slightly to, say, about 150 ohms.

One other point of importance is the best type of high-frequency choke to be used in the "Kirkifier" scheme. It may even be advisable to use two chokes in series, but in any case, what is highly important is the necessity for negligible self-capacity and negligible capacity to earth.

The interested reader is advised to turn to the *Wireless World* for April 20th, as Mr. H. L. Kirke has there given an outline of some highly interesting experiments recently conducted with this form of diode, together with some practical applications.

A New Metal Rectifier

So much then for the high-frequency and detector sections. Let me now turn to a possible modification on the power unit or eliminator side. Last month I showed and discussed an arrangement for employing a large output-rectifier valve, such as the DW4, and the scheme is a perfectly sound and practical one.

Some constructors, however, prefer to use a metal rectifier in lieu of a valve rectifier, and in this connection some interesting information has just come into my hands dealing with a new model Westinghouse metal rectifier, which is to be styled the H.T.11.

Rated Output

I have had an opportunity of examining one of the first samples, but up to the time of writing I cannot furnish any test results; that will come later. It is built up in the familiar style with the mesh body, and measures approximately 8 in. by 5 in. by 3 in.

The required A.C. input voltage is 290/300 volts,

and the specified outputs obtainable are 120 milliamperes at 500 volts, or 150 milliamperes at 400 volts. This is when using two 8-mfd. fixed condensers as reservoirs in a voltage-doubler circuit, such as shown in Fig. 1, and *after* allowing for the voltage drop across a smoothing choke of approximately 100 ohms resistance.

Mains Transformer Alterations

In this connection it is as well to remind readers that since these reservoir condensers are connected in series their maximum operating voltage will be only half of the open circuit figure, namely 750 volts, so that condensers rated to operate at 400 volts D.C. will be quite satisfactory.

In the mains transformer dealt with last month the following modifications would be necessary if this dry rectifier is employed.

In place of the two secondary windings, T_2 and T_3, the first of which feeds the rectifying valve filament and the second of which supplies the high voltages to the rectifying valve anodes, we should require

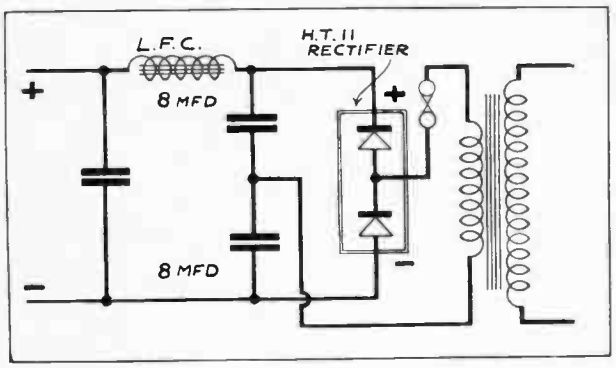


Fig. 1.—The scheme suggested for connecting up the new metal rectifier in a voltage-doubler circuit.

one secondary winding to give the voltage specified above, i.e. 290/300 volts. A considerable saving in the cost of this transformer is thereby effected, and that is one of the reasons why I am bringing the alternative scheme to the notice of readers.

Constructional Work

Experimental work in connection with this set is now well in hand, and I intend to go through with it stage by stage to ensure that no detail is overlooked. The first section to be tackled will be the power unit, as it is felt that the best interests will be served by making this a separate entity so far as construction is concerned, although, of course, ultimately it will form part and parcel of the complete receiver in the final design.

Readers can therefore look forward to constructional information next month, and this will be accelerated to prevent any further delay and possible disappointment to those who have written to me on the matter of the design.

THE TELEVISION SOCIETY

ON Wednesday, April 13th, at 7 p.m., the Television Society held their sixth meeting of the session, when the subject of the address was "Television in America To-day." The paper had been prepared by Mr. A. Dinsdale, and Mr. Ronald R. Poole, a member of the Council, presided. The paper was split up into nine separate sections, as follows:

1. Classification of television workers.
2. Two-way television over telephone circuit.
3. Television signals along a light beam.
4. Future developments in cathode-ray television.
5. Standard 60-hole disc receivers.
6. The Farnsworth cathode-ray system.
7. Sanabria's system designed for projection work.
8. Commercial development and Government control in America.
9. Television, a young man's "game."

A Controlling Body

The main purpose of the paper was to give details of work that has already been carried out in America, and published information concerning this has appeared from time to time in the columns of the TELEVISION Magazine.

In addition, it was pointed out that while in Great Britain the Postmaster-General exercises control over all radio communications, in America a separate Government body, known as the Federal Radio Commission, acts as the controlling body, administering international radio regulations and assigning transmission frequencies. The licences are issued for experimental purposes only.

At the conclusion it was stressed that television is a young man's "game," and an analogy was drawn with the early days of radio when the same principles held.

The audience was counselled to advance boldly on the problems of television, and in solving them secure an assured future surrounded by the satisfaction and rewards of achievement.

Communications

Details of the next lecture are not yet available, but it is pointed out that in future all communications should be addressed directly to the Hon. Secretaries as follows: J. J. Denton, A.M.I.E.E. (business communications and memberships), 25 Lisburne Road, Hampstead, N.W.3; W. G. W. Mitchell, B.Sc. (editorial communications and lectures), "Lynton," Newbury, Berks.

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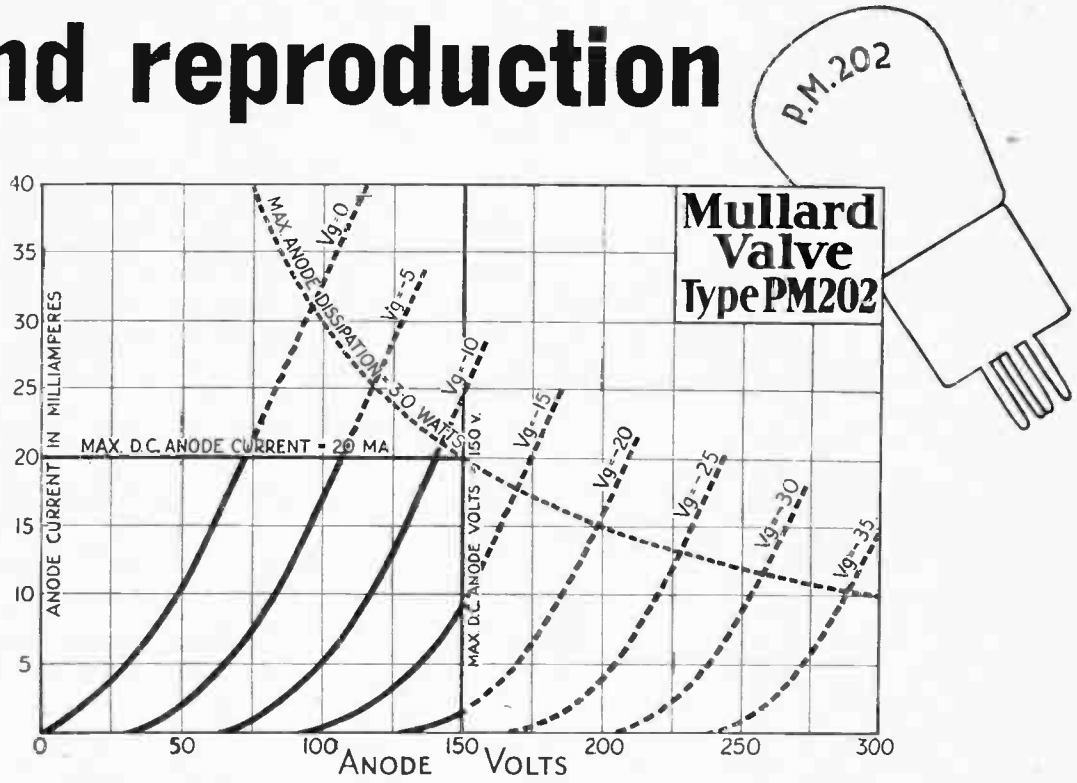

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Max. Anode Voltage 150 volts
Grid Bias for 150 Anode Volts—12.0 to 15.0 volts.

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The Mullard range of valves for use in A.C. mains equipments comprises types for every stage, including full-wave rectifiers of large output. The D.W.4 rectifier, giving 120 mA at 500 volts, is specified for the "Visionette" described in this issue of "Television."

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Illustrating how a close-up image appears on the television screen.

The Frequencies in Television Signals

By *E. G. Bowen, M.Sc.*

THE early development of television was hampered by a considerable volume of adverse criticism based on the grounds that the frequencies involved would be too high for television signals to be broadcast by wireless. The critics used a false argument. They imagined a television image

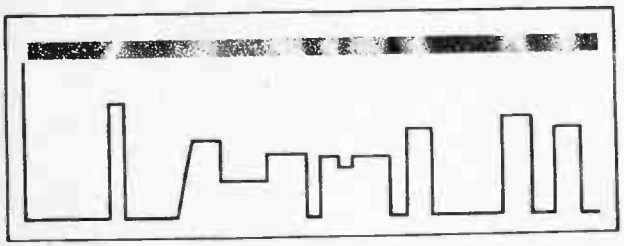


Fig. 1.—Variation of intensity along a vertical section of a photograph of a woman's face. (Note.—This strip was cut from a photograph of Maud Hansen in TELEVISION, *November* 1930.)

as similar to a newspaper illustration built up from an immense number of dots of different intensity. A small picture measuring 1 in. by 1½ in. might include as many as 2,500 dots, and since a moving picture has to be repeated at least twelve times every second, these critics argued that at least $12 \times 2{,}500 = 30{,}000$ dots or impulses had to be transmitted every second to give a recognisable television image.

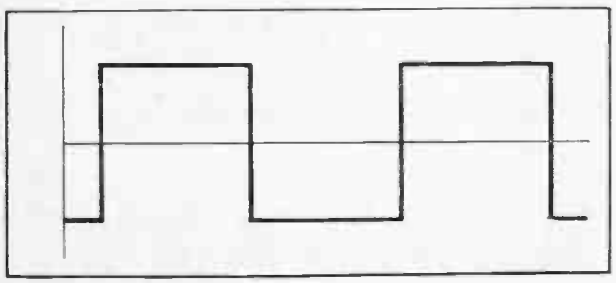


Fig. 2.—Showing a wave having a square formation.

At that time it was difficult to broadcast and receive satisfactorily frequencies of 5,000 cycles a second. The broadcasting of television signals of 30,000 cycles a second was therefore considered impossible.

But with television an accomplished fact, it soon became evident that the "dot" theory was at fault. It is only necessary to look at the problem more reasonably to find why this is so, and by going yet a little deeper we can make an estimate of the actual frequencies used in a good television transmission.

Where the "Dot" Theory Fails

Consider for a moment what happens at a television transmitter. The process of scanning splits the person or scene being televised into a number of vertical strips, and the changes of intensity along each strip are impressed on a photo-electric cell.

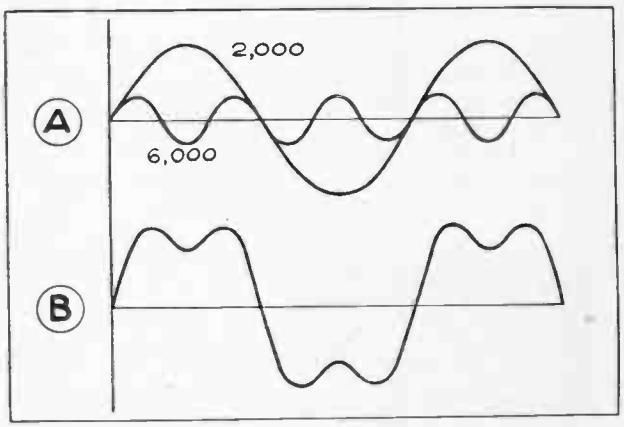


Fig. 3.—The addition of two waves possessing frequencies of 2,000 and 6,000 cycles per second.

The kinds of variations of intensity which fall on the cell are shown in Fig. 1, in which the strip scanned is a vertical section cut from a photograph of a woman's face. The intensity curve consists of some five very rough rectangles of different lengths and heights. The height is a measure of the actual intensity falling on the cell, and the length a measure of the time for which it falls. Since in the transmission of television signals nearly 400 strips are scanned every second, then on this basis of five rectangles per strip there would be only $5 \times 400 = 2.000$ impulses transmitted every second.

While the dot theory very much over-estimates this frequency, the present estimate of 2,000 impulses a second is lower than the true value. This

is because a rectangular waveform of the type found in Fig. 1 contains not only its fundamental frequency, but also a large number of harmonics having frequencies many times greater than the fundamental.

Analysis of Square Waveforms

In Fig. 2 is drawn a square waveform which it will be supposed has a frequency of 2,000 cycles a

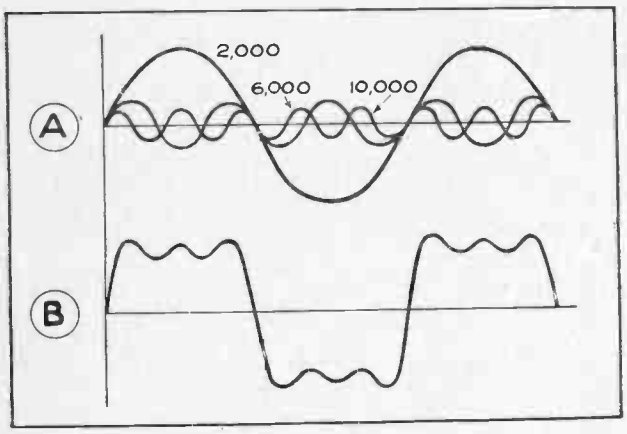


Fig. 4.—In this case the addition of three frequencies gives roughly a square waveform. The highest frequency is only 10,000 cycles per second.

second. Such a waveform is built up of a whole series of simple harmonic vibrations. There is the fundamental frequency of 2,000 cycles a second and harmonics having frequencies 3, 5, 7, 9, . . . times the fundamental. That is, a square waveform of 2,000 cycles contains in addition frequencies 6,000, 10,000, 14,000, and upwards.

This photograph of a television image, taken three years ago by an amateur, gives a rough idea of how the subject is scanned in "strips."

Suppose we combine just the first two of these components. They have frequencies 2,000 and 6,000, and are shown together in Fig. 3 *A*. The result of their addition is shown in Fig. 3 *B*, and already we can see a roughly square waveform appearing.

An addition of three components having frequencies 2,000, 6,000, and 10,000, as in Fig. 4, improves matters, but it requires as many as ten terms to give the substantially square waveform of Fig. 5.

The tenth component corresponds to a frequency of 38,000 cycles a second, and if such frequencies had to be reproduced, then the broadcasting of tele-

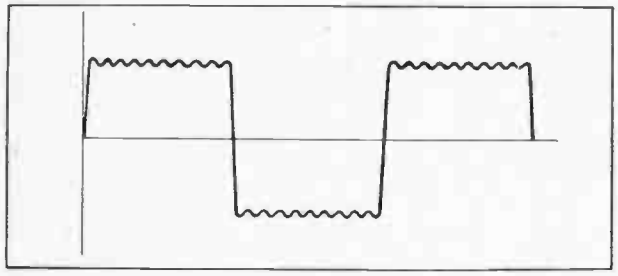


Fig. 5.—Although the waveform shown is square in shape, it necessitates a high frequency of 38,000 cycles per second.

vision signals would be truly impossible. But there is yet another factor to be considered, which when allowed for shows that the frequencies required for good television broadcasts need not be higher than those usually met with in the broadcasting of speech and music.

How the Scanning Disc affects the Result

Reverting to the scanning of a simple object by means of a scanning disc. Are the sides of the "rectangular" impulses falling on the photo-electric

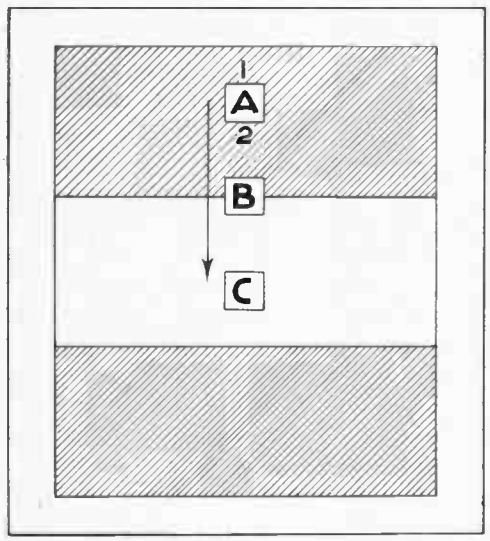


Fig. 6.—Three different positions of a slot scanning a simple picture made up from a single white band.

cell at the transmitter as steep and square as those shown in Fig. 1? Think of a slot passing over a simple picture consisting of a single white band, as in Fig. 6. When the slot is at *A*, no light falls on the photo-electric cell, and none will fall until the edge marked "2" reaches the boundary of the white band.

As the slot passes over the boundary, the intensity will gradually increase until at *B* it is half its final value. Only when edge "1" reaches the boundary will the maximum amount of light pass into the cell. The same thing happens at the next boundary between white and black, so that although the curve of intensity of the original subject is square, as in Fig. 7*A*, the response curve the photo-electric cell gradually builds up is horizontal and falls again as in *B*. Such distortion due to the slots of a scanning disc has been dealt with in detail by Dr. Robinson in an early issue of TELEVISION.[1] A mathematical analysis of the problem has been made by Mohr and a report on his work has also been given.[2]

Conclusions

We have already seen (Fig. 5) that for a more-or-less exact reproduction of the steep sides of a

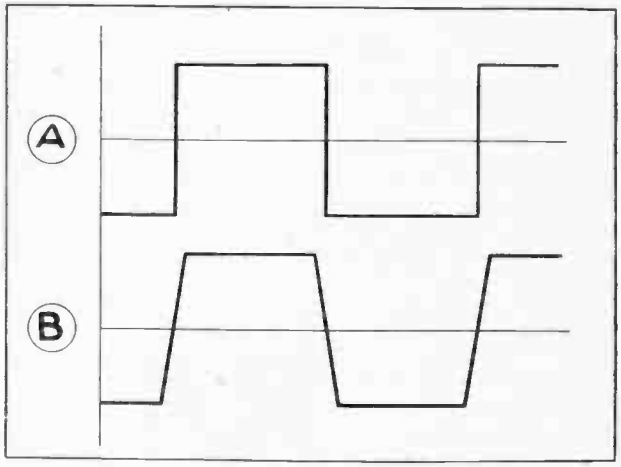


Fig. 7.—Showing the distortion of a square waveform by the slot of a scanning disc.

square waveform, harmonics of frequency as high as 38,000 cycles are necessary. But Fig. 7 shows that the sides of the waveform actually transmitted are not square. In fact, they approximate closely to the waveform of Fig. 4*B*, which contains no frequency higher than 10,000 cycles a second. (The humped top of the curve in Fig. 4 can be neglected, as this would be smoothed out by the slot of the scanning disc.)

Considering everything—the type of waveform found in television signals, how this waveform is built up of simpler waveforms, and how its sharp edges are modified by the slot of the scanning disc—we can say that on the average the frequency of signals in a television transmission does not exceed 10,000 cycles a second. This is quite a reasonable frequency which, when used to modulate the carrier wave of a broadcasting station, does not cause any sideband spread over that allowed by international convention. Furthermore, it is a frequency which is well within the capabilities of a well-designed low-frequency amplifier.

[1] TELEVISION, vol. 1, Nos. 9 and 10.
[2] TELEVISION, vol. 2, No. 23.

Workshop Hints

By *Thomas W. Collier*

IT is proposed now to give constructional details of a few handy tools which can be made by the amateur without much difficulty. Every constructor will find a use for at least one pair of clamps, and several different sizes are very useful and amply repay for the trouble involved in making.

Clamps

The particular type in mind are commonly known as toolmakers' clamps, and consist of two pieces of square steel rod and two screws. Fig. 1 illustrates

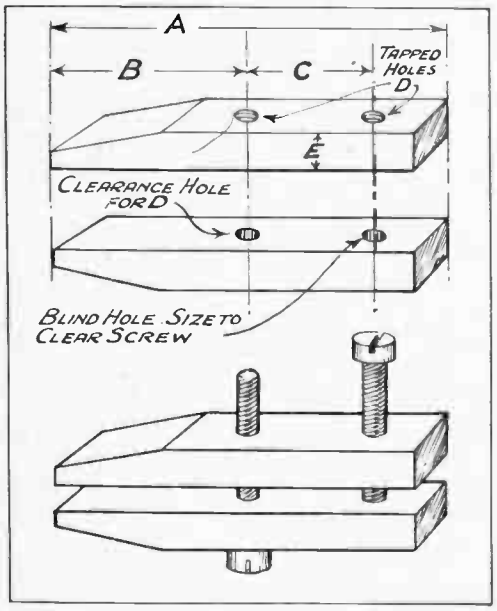


Fig. 1.—A self-explanatory diagram, showing the construction of toolmakers' clamps.

the parts in detail and assembly, while the following table gives the various sizes of materials.

A	B	C	D	E
in. 2	in. 1	in. $\frac{3}{4}$	4 B.A.	in. $\frac{1}{4}$
3	$1\frac{1}{2}$	$1\frac{1}{4}$	2 B.A.	$\frac{3}{8}$
4	2	$1\frac{1}{2}$	$\frac{1}{4}$ in. E.S.F.	$\frac{1}{2}$

The jaws should be made of silver steel, hardened (heat to a bright cherry red, and plunge in clean cold water), and then tempered to a deep blue. Clean off at least one side after hardening for this purpose and heat in a tray of silver sand. This will ensure even heating.

It will not be necessary to harden the screws, but they should be made of steel, preferably silver or carbon steel. Screws made from either metal are tough and durable, but ordinary mild steel screws need frequent replacement.

A Draw-bolt

Another very handy tool is a draw-bolt. This functions in much the same way as the standard

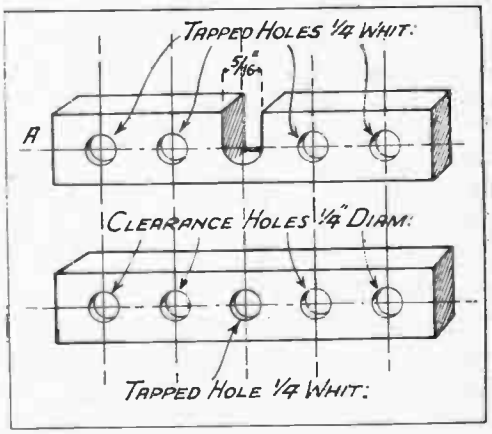


Fig. 2.—The draw-bolt is a handy tool functioning in the same way as a wheel-draw.

types of wheel-draws. I have found this particularly useful in removing obstinate discs and toothed wheels from motor spindles, where it is vitally important that the spindles must not be bent. Fig. 2 illustrates the constructional details, and Fig. 3 its application. The elongated hole in the section *A* should be placed over the spindle and behind the wheel or part to be removed, the diagrams being self-explanatory.

Mild steel may be used for all the parts, as this is not a tool required frequently, but it will save much time and disappointment when difficulties of that nature present themselves.

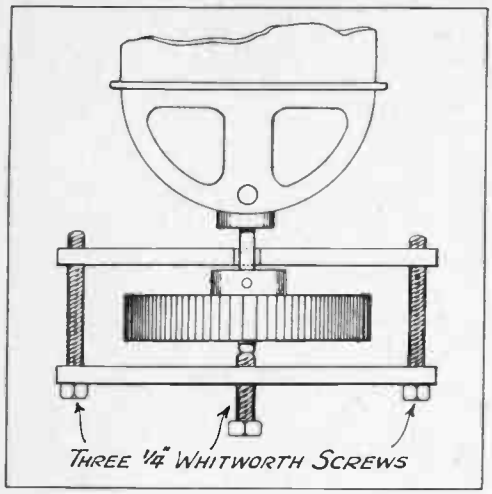


Fig. 3.—Using the draw-bolt to remove an obstinate cog wheel from the motor shaft.

Special Screwdrivers

Right-angled screwdrivers are always handy to keep by you. Fig. 4. shows this type of tool before and after bending; note particularly that the blades are forged at right angles to each other before bending. Silver steel should be used, and both operations carried out with the steel red hot. To avoid cracking, do not work the steel below a cherry red.

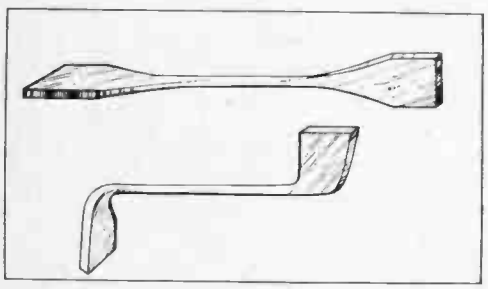


Fig. 4.—One type of special screwdriver before and after bending.

Harden and temper to a deep purple, and the screwdriver will be ready for use.

Tightening Slotted Nuts

Comes now the fork screwdriver, for use with those slotted nuts found frequently on radio components. Three sizes should cover the average range of threads in use: namely, 2, 4, and 6 B.A. Here again silver steel rod may be employed, the outside diameter being about three times the diameter of the screw thread. When making this type of screwdriver proceed as for an ordinary screwdriver, but file out a gap in the centre, as shown in Fig. 5 *A*, before hardening and tempering. This will answer very well in those cases where the screw thread does not project far beyond the end of the nut, but where a slotted nut is used as a lock-nut and a length of thread projects sufficient to screw on an extra nut (usually for connecting purposes), it is necessary to use a type which will accommodate the extra thread. This is also shown at *B*, in Fig. 5.

The silver steel rod is drilled down for thread clearance and then filed on either side in order to leave the small blades projecting. Care should be taken not to file too sharply into the corners, otherwise the blades will break off. In many cases it is well to "radius" them and harden and temper down to a purple.

Coil Winding

Very few constructors go so far as to wind their own coils for synchronising gear, yet this is really quite a simple operation. All that is required is a coil former, wire, and tape. For a former something similar to that shown in Fig. 6 is suggested. This consists of a wooden centre, slightly tapered, and two outside flanges. All three parts are held together by means of a bolt, washer, and nuts. A hand brace should be used for winding.

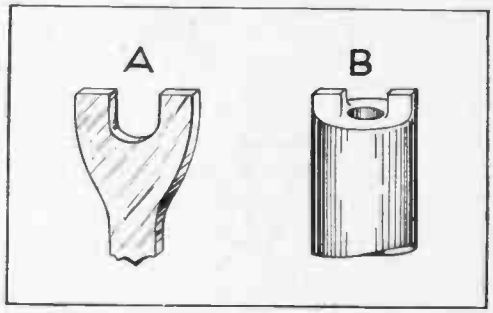


Fig. 5.—Slotted screwdrivers for tightening up slotted nuts.

The slots shown in the former are intended as a channel for thread to be passed round the winding before removing from the former. The coil should be immersed in shellac varnish and baked. When dry and hard, bind round with ordinary linen tape, apply a coat of shellac varnish, and when this has dried the coils are fit to be handled.

Case Hardening

Case hardening is a simple process by means of which soft iron or steel may be brought to a hardness equal to that of cast steel. Drills, pin cutters, and other small tools may be made with ordinary mild steel, which when treated by this process will be found equal to the tools sold by the dealers. Dies suitable for restoring bruised or damaged threads can be made by cutting a few slots with a file through the threads of any steel nut (which must, of course, be of a similar size to the thread required). The slot should be deep enough to clear the bottom of the thread. Taps may be made similarly, and any

(*Continued on page* 111)

(Concluded from page 93)

purpose will be seen in Fig. 3, each lead passing from terminal 6 to a screw making electrical contact with the base.

Connecting Up

When the wiring is completed (I advise you to cross-hatch each lead on the diagrams as it is put in place on the set, and in this way avoid "sins of omission"), check it over once to be quite sure everything is in order, and then proceed to connect up the set for a trial run before housing it in its cabinet.

A Trial Run

Place on the pair of coil-screening covers, making quite sure that none of the wires to the coils touch the metal but are accommodated in the centre of the slots provided. Insert each valve in its holder, not forgetting to add the two connectors to the S.G. and pentode valves; add the fuse-box cover with its pair of 1-amp. fuses, and finally insert the mains plug into the house electric-supply socket.

By incorporating the combined wall plug and adapter specified, it is immaterial whether this socket position is of the bayonet or twin-socket variety—both are provided for by the neat Goltone combination.

With the wave-change switch knob turned to give

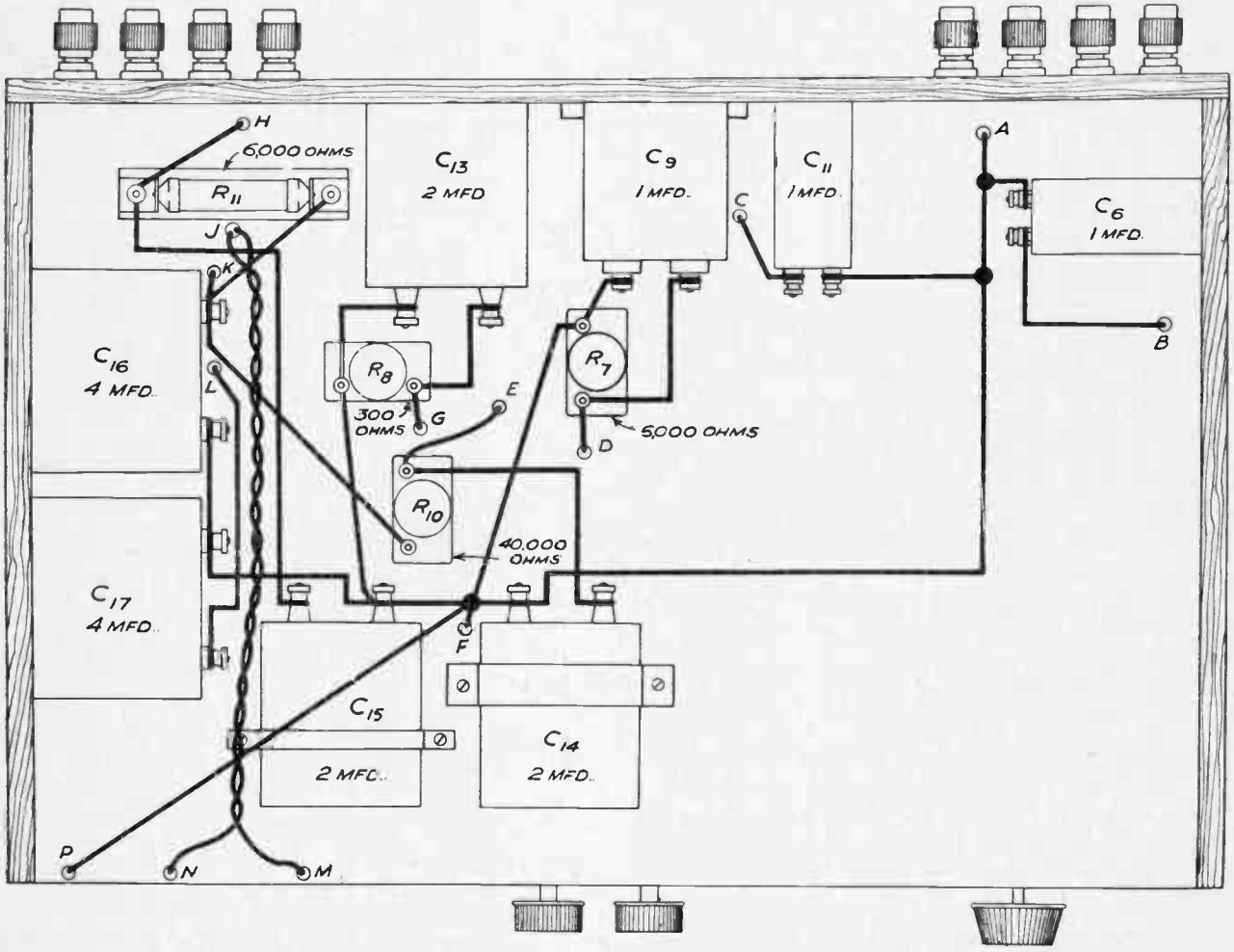


Fig. 4.—The wiring and component positioning which must be carried out below the baseboard. This diagram will be used in conjunction with Fig. 3.

For the first test join the aerial lead-in to the terminal "aerial 1," and, of course, the earth to its proper point. It is advisable to assimilate the simple operating details in conjunction with a loud speaker, so next join the pair of leads from this "sound reproducer" to the pair of terminals included for this purpose.

either the medium or long waveband, whichever covers your local station, switch on the mains.

First Impressions

It will take nearly half a minute for the mains valves to become fully operative, and then proceed

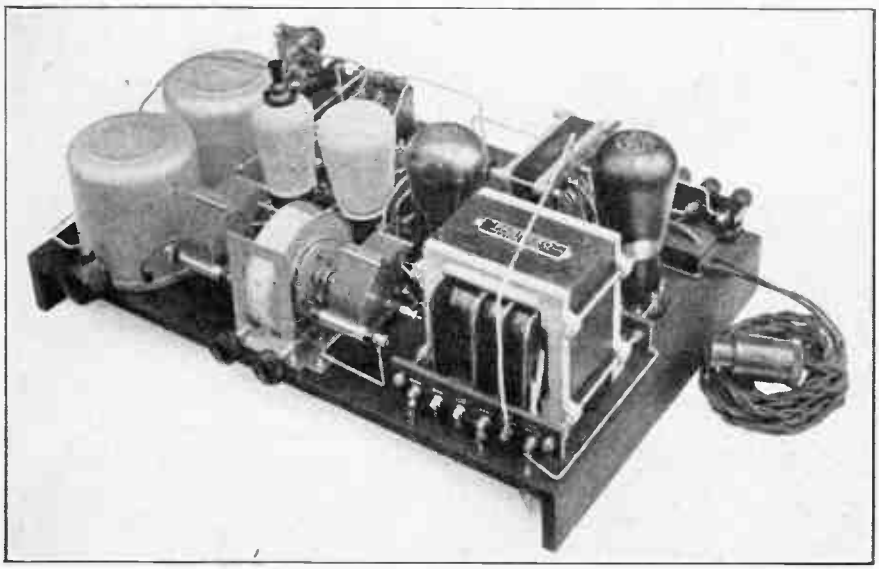
to tune in your local station by rotating the pair of moving plates on the gang condenser through the medium of the right-hand control knob.

If all is in order the constructor is sure to be impressed with the quality of reproduction, this assuming that the loud speaker employed in conjunction with the set is a high-class model.

Selectivity and volume are controlled through the differential condenser C_1 at the back, while the second condenser knob on the left at the front acts as a trimmer to enable the station to be tuned-in accurately and compensate for stray capacities on the aerial side.

Adjustments

Adjustments should also be made to the pre-set condenser C_{10}, and in some cases it may be found that better results are secured when the maximum capacity of this condenser is increased to ·001 mfd. instead of the ·0003 mfd. originally specified.



Complete with its valves, prior to inclusion in the cabinet, the "Visionette" has quite a professional air and the constructor can be proud of his work.

Now try your hand at receiving one or two other broadcasting stations. The absence of a reaction control naturally reduces the "range" of the set, but this point was made clear in the opening paragraph last month. In spite of this, however, I think you will be satisfied that the set fulfils the original claims, and a trial can now be made to assess its value for the reception of the television signals broadcast from Brookman's Park by the Baird process.

A Warning

First of all render the receiver "dead" via the house mains switch, and here let me issue a note of warning. Do not make any adjustments inside the set, except those to the condensers C_1 and C_{10}, without first of all switching off. Too often are components damaged through a failure to observe this rule. For example, if a valve is removed from its holder the reduction in "load" will bring about a rise in both the plate and filament voltages applied to the other two valves, and this may cause a breakdown.

To counteract the temptation for the user to change direct from sound to vision reception, no switch is included for this purpose, and it is necessary to disconnect the loud speaker and then connect the vision apparatus to the terminals marked output + and output —. Here again the set must be switched off, otherwise by breaking the anode circuit of the pentode valve the pentode valve will suffer a premature demise.

Watching the Television Image

When the vision apparatus is joined up and the motor running, switch on the "Visionette" once more and tune in to the Brookman's Park transmission of television—either the London Regional or the London National, whichever station is responsible for the signals at the time the test is made —and watch for the image.

The component values have been calculated to give the correct current through the neon lamp—25 to 30 milliamperes—and a good bright image will result. Do not forget to make adjustments to C_1 and C_{10} for the best vision images, and also try the effect of joining the aerial to condensers C_2 and C_3. This will cause an increase in signal strength, but selectivity will not be quite so good as with the original C_1, and the best arrangement to suit your own conditions will be found quite readily. In addition, the value of the trimming adjustment provided by the movement of the stator plates of the aerial tuning condenser will soon be apparent.

Good Results

I have been delighted with the television images secured through the medium of the "Visionette,"

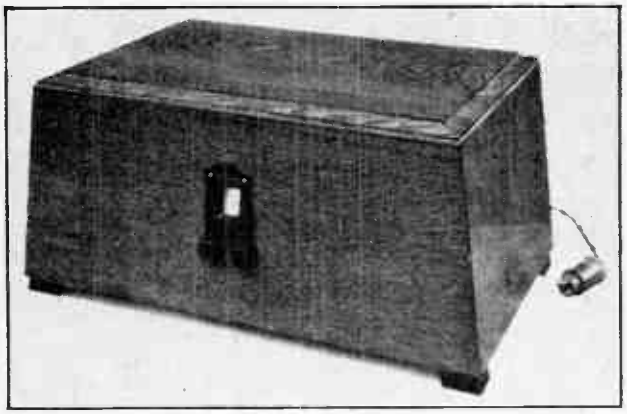
and I trust other constructors will be successful in duplicating the results. Provided the instructions have been followed exactly, everything will be plain sailing, and it may interest constructors to know that I am extending my tests with this set and hope to report on this work in a future issue.

Once satisfied that you are "at home" with the set, proceed to house it in its cabinet. This is supplied with a central cut-out in the front, to allow the two condenser knob spindles to pass through, and also to take the four screws which pass into the condenser framework and hold the moulded dial in position.

Housing the Set

In addition a hole must be drilled by the constructor himself to allow the wave-change switch rod to pass through the wooden panel and be controlled by a knob at the front on the left. This is done by measuring up the hole position accurately.

Slide the set in carefully, screw on the Formo "dial" and add the switch knob. Now cut out



The smart appearance of the housed set can be gathered from this photograph. It was taken before drilling the hole to take the wave-change switch rod.

holes in the cabinet back, which normally is held in place by two clips. These holes are to allow the eight Belling-Lee terminal heads to pass through so that connections can be made, and also to accommodate the knob of the differential condenser C_1. In addition a small slot must be made in the cabinet back for passing through the mains flex.

Should an accident occur at any time and the fuses blow as a consequence, just slip off the cabinet back, remove the twin fuseholder top, replace the fuse or fuses, and then reclip in place. No danger can arise here, for the removed portion is quite "dead" electrically.

The modern style of the oak cabinet is a very pleasing one and constructors will be delighted with the professional air given to their set in this way.

Workshop Hints

(*Concluded from page* 108)

steel screw will serve for the purpose, all that is required being a few flats filed across the thread.

The method of hardening these or any other small tools which have been made from soft steel, is first to purchase a small tin of "Kasenit" powder. Heat the tools to a very bright red and immerse quickly into the powder, which will melt and flow around the hot steel, reheat and plunge into clean cold water, when it will be found the tools have a very hard casing that cannot even be filed. The greater number of times the hot steel is dipped into the preparation the harder the tools will be.

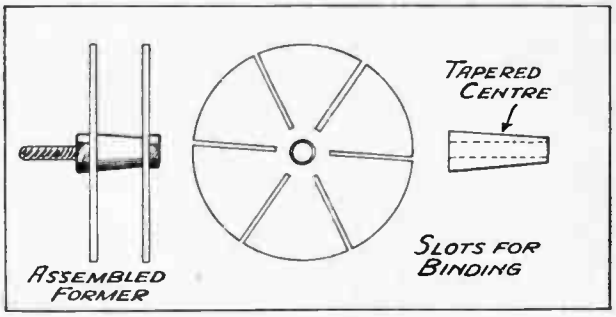
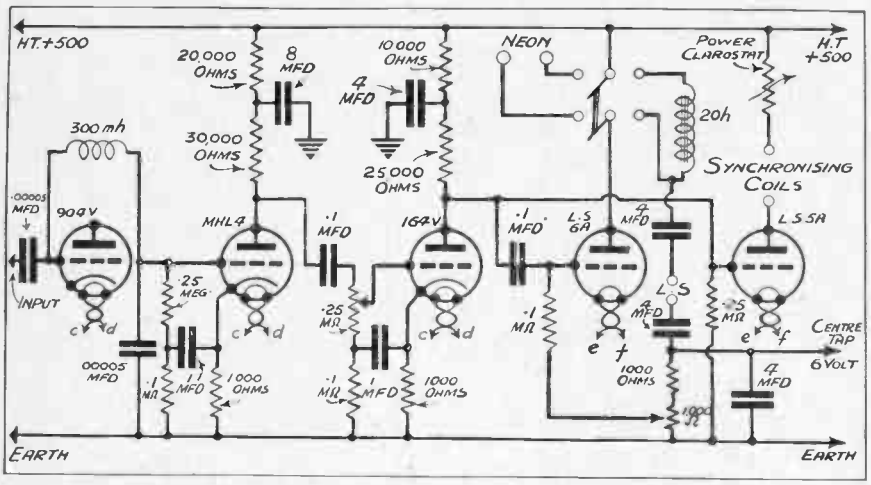


Fig. 6.—It is quite a simple matter to make up your own formers for winding coils, and the scheme suggested is indicated above.

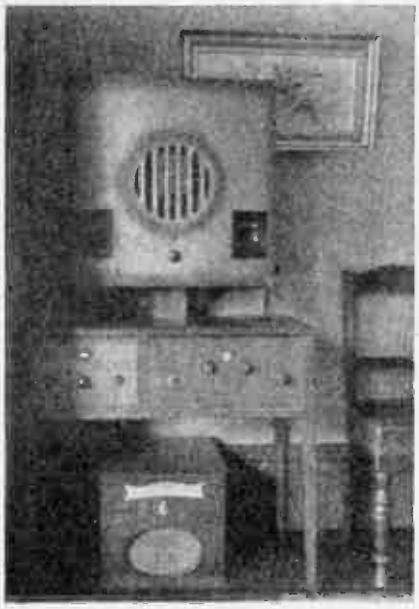
The Enthusiast Sees it Through

(*Concluded from page* 99)

Baird parts, with a home-made motor stand, neon stand, etc., and all mounted behind a firescreen loud-speaker baffle, as the photographs show. A reed-type loud speaker is also mounted to give the sound accompaniment. Trouble was experienced for a long time owing to interference from the universal motor causing a very streaky image and absolutely ruining the sound accompaniment. This was finally cured by joining two 2-mfd. condensers across the motor leads, and joining their centre point to the motor carcase. Curiously enough, earthing this point brought the old trouble back as strongly as ever.



The very well-planned scheme for the detector and low-frequency amplifier unit used in Woodbury.



Mr. Ware's vision apparatus, complete with the wireless units and loud speaker.

"For some time several sets were tried, using one screened-grid valve and up to three stages of R.C. coupled L.F., with anode-bend rectification. Results were unsatisfactory, however, dark shadows and patches ruining the picture by night, and there was insufficient strength to get a good picture by day. Two screened-grid stages were found absolutely necessary. The signal strength was then sufficient to load a power-grid detector on the morning transmissions, and this was found to be a very great improvement over anode-bend rectification. Trouble was experienced, however, with instability and hum. These two troubles disappeared completely on changing over to variable-mu valves.

"The next step was to change from power-grid to diode rectification, using the new 'Kirkifier' described recently in the *Wireless World*. This was a real improvement, giving, with the extra L.F. valve, more strength than the old arrangement and better definition. Incidentally, on broadcast reception the quality on low inputs was very noticeably improved. After this a separate synchronising valve was added, thus bringing the complete receiver to the circuit shown.

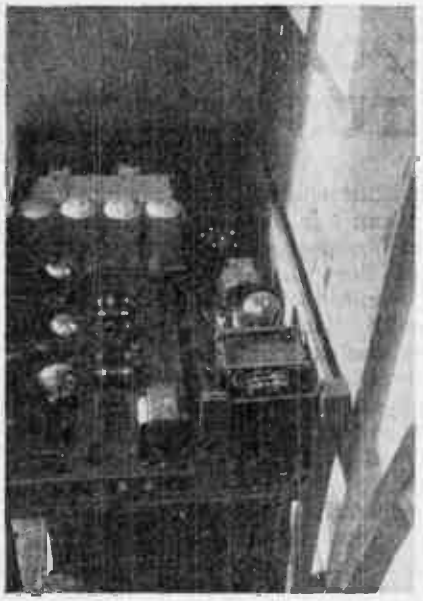
"There are one or two rather interesting points to notice about this circuit, especially comparing it with Mr. Barton Chapple's proposed 'Tele-Radio' Receiver, which has, of course, been published since this set was constructed. Both use variable-mu valves, but in my case I have used a "link" type input band-pass filter. In regard to this, I must venture to disagree with Mr. Barton Chapple when he considers this a disadvantage on the ground that it would limit the high-frequency response.

"With three tuned circuits in cascade, as he proposes to use, the tuning curve is bound to be fairly sharp, thus definitely, to a certain extent at any rate, cutting the sidebands. With a suitably adjusted band-pass filter, this can be very largely prevented. However, this is the only point I would criticise in Mr. Barton Chapple's excellent design. I may say that reception has been tried both with and without this band-pass filter, and it was found to be a definite improvement. A ·04-mfd. coupling condenser was substituted for the ·05 mfd. specified, however, thus broadening the band width accepted from 8 kilocycles to 9–10 kilocycles. This is not sufficient to cause double-humped tuning, which

would of course be fatal to results. This alteration, by the way, caused quite an appreciable drop in signal strength, but the result was an image with definitely more detail.

"The four stages are tuned by a four-gang condenser. The trimming of the aerial circuit is by means of the semi-variable aerial condenser, the internal trimmer being left at minimum. All the trimmers (not shown in diagram) are adjusted nearly full-in, so as to obtain maximum transfer of energy across the aerial condenser, this also helping to flatten the tuning curve.

"The grid-bias arrangements for volume control were supplied by the Mullard people, and work admirably. The potentiometer should be graded for best control. The coils used are Colvern 'Link' band-pass, followed by a Colvern K.T.A.1 and a K.T.A.2. In the light of experience, two K.G.O. coils would be preferred in place of the K.T.A.1



Side view of interior of set with main panel on left. Since this photograph was taken another L.F. valve and diode detector has been added.

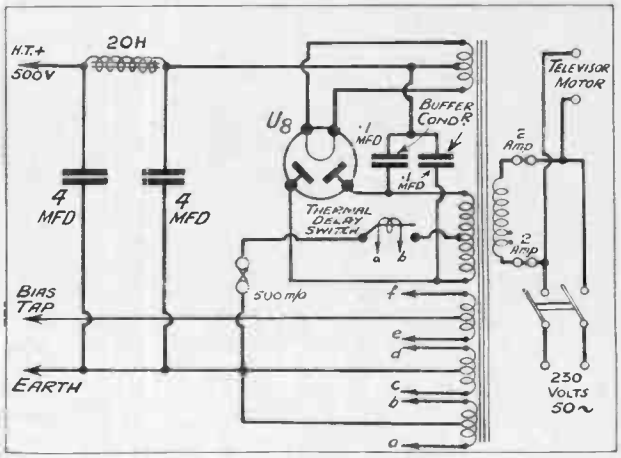
and K.T.A.2, as the set is unstable on long waves with the volume control at maximum. It is absolutely rock stable on the medium waves.

"The 8-mfd. decoupling condenser in the anode of the first L.F. valve is necessary to ensure complete stability in the L.F. amplifier.

"Variation of the neon field is made by means of a potentiometer in series with a fixed resistance, providing grid bias for the output valves. This works excellently, and is less open to criticism than a resistance in the anode circuit.

"The set is made up in three units, as the diagram shows, H.F. and Det., and L.F., and Eliminator, inter-connections being made with Clix plugs and sockets. Each unit consists of a 2-in. deep chassis with a wood panel, the chassis being made of wood covered with thick copper foil. As far as possible all grid circuits are mounted and wired underneath the chassis, and all anode components above the chassis. All heater wires are run in lead-covered wire, bonded to earth. As a result, mains hum is noticeably absent. Slight modulated hum was completely cured by connecting the ·1-mfd. buffer condensers (2,500-volt test) across the transformer secondaries as shown.

"The loud speaker normally used for broadcast reception on this set is an Epoch moving-coil. It is in the opposite corner of the room, and so is not shown in the photographs. The set supplying the



In this eliminator unit a slight modulated hum was cured by two ·1-mfd. buffer condensers.

sound accompaniment is situated in the workshop, with an extension running to the vision apparatus. It is a four-valve battery-operated set, S.G.-Det.-2 L.F.

"Now a word as to results. Before receiving a transmission, the motor is run for fifteen minutes or so to warm it up. The image can then be held absolutely steady on actual 'turns,' but is inclined to 'spill-over' sometimes between items. (The mains here are definitely not as steady as they should be.) The picture is very clean and clear, with no dark shadows or streaks, and no black patches. Every movement is visible. For instance, a conjuring trick with a wand and newspaper was followed perfectly well and the pictures on the newspaper could be clearly seen. Rupert Harvey's cartoons come over very clearly, as do the men laying the carpet between items occasionally! The picture is, in fact, quite equal to the picture shown me by the Baird Company in 1930, but it is admittedly not equal to the amazingly good demonstration given me at Long Acre late in 1931. However, the next thing is to improve the frequency response of the receiver still further, and I will let you know all details if any further success is achieved."

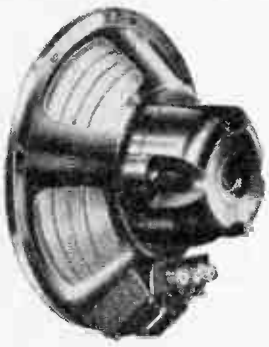
TRADE NOTES OF THE MONTH

REPORTS ON APPARATUS TESTED

Celestion PPM Loud Speaker

WE have now completed our tests on the Celestion PPM Permanent-magnet Moving-coil Speaker to which reference was made in these columns last month. Messrs. Celestion Limited use as their slogan "the very soul of music," and their latest product certainly maintains that company's reputation for being specialists in sound reproduction.

Among the features noted in this PPM model is the specially stiffened and impregnated diaphragm which, incidentally, is moisture proof. The diaphragm is centred by a particularly robust method of twin suspension that permits of large movements



The new Celestion PPM Permanent-magnet Moving-coil Loud Speaker, which gave such good results on test.

of the diaphragm and ensures it axial movement. The cobalt-content steel magnet is of a new design, and it is claimed gives a very high flux density. It is by this means that very good sensitivity is obtained under test.

The model is housed in a strong metal chassis, with a thick felt ring to form a close and vibrationless joint with the baffle, and, to facilitate its use with any type of speaker fret, it is supplied screwed to a small wooden baffle which can be mounted behind any aperture from 7 in. to 11 in. in diameter.

One's first impression of good quality when judged from external appearances was substantiated by subsequent tests. The reproduction was very good indeed, being clean and brilliant without any suggestion of shrillness. The bass was quite well maintained and showed an absence of that boominess which often mars moving-coil performance. Sensitivity was above the average for this class of speaker, and it was possible to feed in over 2 watts without any suggestion of distress.

Speech was quite natural when heard from this speaker, and if it is remembered that the price of the speaker complete is only 47*s*. 6*d*., readers will appreciate that it is a very attractive proposition.

A tapped dual-impedance transformer with liberal current carrying capacity is included with the speaker. Two types of transformers are supplied, one for ordinary output valves and the other for pentode valves, and when ordering it is essential to state which type is required for use in conjunction with the wireless receiver.

Eelex Short-wave Converter

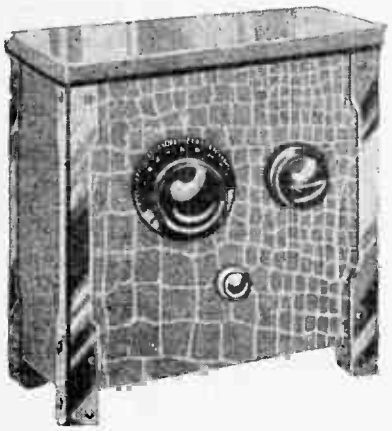
The battery-model, type "A," Eelex Short-wave Converter, which we have now been able to test, employs a supersonic circuit, and the valve in the converter is a combined oscillator and first detector. It is necessary to use this converter in conjunction with a broadcast receiver employing one or more stages of screened-grid H.F. amplification and, in addition, the same set must tune between 1,000 and 2,000 metres.

In use the converter passes a beat note to the long waves through the long-wave coils of the main set, these coils acting as intermediate-frequency trans-

formers. The receiver and converter therefore become, in effect, a short-wave superheterodyne set. The converter is supplied with one coil which covers a wavelength range of approximately 16 to 60 metres, and full instructions are given showing how the proper tuning ranges can be obtained by adjusting the crocodile clip passing to the short-wave coils. Only one or two leads are needed to connect up the unit to the broadcast receiver; but it is pointed out that it is essential to use a good earth connection to avoid any slight trace of hand capacity.

The type of valve recommended for use in the converter is a Mullard PM2DX or a Mullard PM1LF, or a Mazda L210. Of course, the equivalents in the 4- or 6-volt range can be employed if desired.

Very careful instructions are given to show how it can be employed in order to tune in the short-wave stations. No difficulty should be experienced in obtaining proper oscillation, especially in the neighbourhood of 30 metres, where so many interesting short-wave transmissions are to be found.



The very effective Eelex Short-wave Converter reviewed on this page.

A little practice will show that results in some cases may be better with the aerial clip on the first or second turn, and in other cases on the third or even the fourth turn. The clip should be tried in the various positions to see which gives the best results. The reaction control on the broadcast receiver is used in the normal way, while tuning is effected by the tuning condenser on the short-wave unit, the reaction control on the set unit requiring only an occasional touch to keep the converter oscillating.

Of course, it is necessary to bear in mind that the tuning on the short waves is extremely sharp, and if the condenser is turned too fast it is possible to pass over many powerful signals without noticing them.

We secured very satisfactory results with this converter, very strong signals being obtained from many stations when used in conjunction with a standard three-valve receiver employing one screen-grid H.F. stage, detector, and pentode output. There is a leatherette covering to the wooden cabinet housing the converter, and since the controls are so easy to operate, we can thoroughly recommend this Eelex converter as being of great use to those readers who

(*Continued on page* 119)

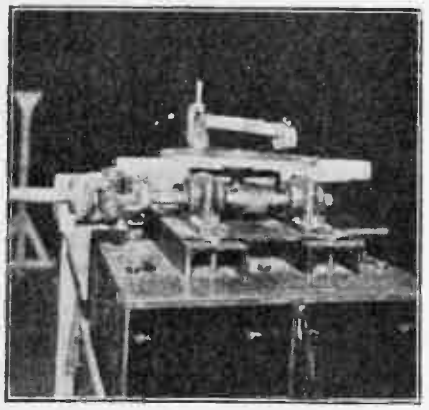
LETTERS TO THE EDITOR

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

TELEVISION RECORDS

To the Editor of TELEVISION

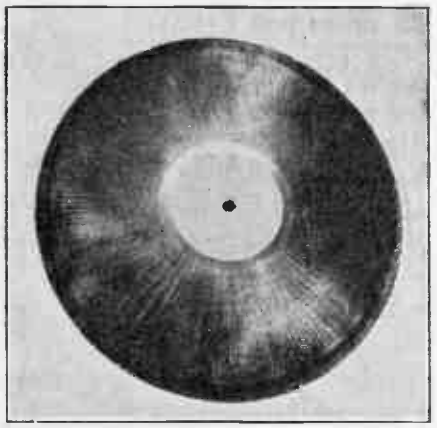
DEAR SIR,—I find, in common with many other television experimenters, that the B.B.C. transmission hours are all too short for really useful reception tests.



A view of Baird's original Phonovision recording device.

One alternative which presents itself is records of television signals, and I see that in Chapter X of *Television To-day and To-morrow,* such a system is described, but no details as to the makers are given.

A double-track record with accompanying speech would be invaluable for experimenters like myself,



An experimental Baird Phonovision record looks like this.

and I shall be interested to hear if such a record is obtainable, and at what price.

I have not previously written to you, but as a keen reader since No. 1, I must take this opportunity of expressing my real admiration for the way in which you are so vigorously supporting the cause of British television each month in the TELEVISION Magazine.

Would you also be good enough to send me particulars of the Television Society, and terms of membership?

With thanks in advance.

Yours faithfully,
WINSTON P. JONES.

51 HIGH STREET,
SOLIHULL,
BIRMINGHAM.
March 14th, 1932.

DEALING WITH SCANNING

To the Editor of TELEVISION

DEAR SIR,—In TELEVISION for November 1931 (pp. 338–9) Mr. D. R. Campbell drew attention to

An experimental Baird Phonovisor. Images appeared in the slot in front of the record, and were made visible to the observer in the inclined mirror mounted beside the slot.

the importance of *low* frequencies in television, pointing out that they are more essential for pictorial results than the much-discussed higher frequencies. The illustration he gave of the harmful effects of lack of L.F. was so striking and instructive that one ventures to hope for more detailed explanation in a future article. The presence of the dark streaks in the picture is easily understood, since if slowly varying impulses cannot pass they naturally fail to stimulate the neon. The "white shadows" are more puzzling at first sight, but presumably are due to reversal of phase at certain stages, causing black and white to exchange rôles.

It seems fortunate that in the case of sound the ear combines each train of vibrations into a single tone-sensation, otherwise an odd number of R.C. amplifying stages might yield negative music.

With regard to maximum frequency, some authorities take this to be the product (Revs per Second) × (Number of "Points" or Elements), but in the report on the Berlin Radio Exhibition (*Journal of Television Society*, December 1931, p. 100) half this product is taken as the maximum, which seems more reasonable With the former assumption, the maximum frequency would be $1/T$, where T is the time of scanning a length d equal to the diameter of a "point" or elemental area (supposed square). If we suppose a picture strip to cross at right angles a series of bands, alternately black and white, each of width $d/2$, then, if scanned by an extremely fine slit, these bands would give rise to an intensity-time curve consisting of a series of rectangular waves, of wavelength d, and frequency $1/T$. But with the actual square scanning aperture of diameter d, evidently the curve would degenerate to a straight line, since equal quantities of black and white would be exposed at any instant. The bands would therefore be invisible at the receiver (a separate single band might be visible, though faint and blurred). It seems useless to provide frequency facilities for results which the scanning aperture is incapable of rendering. However, theory and practice are very different things, and knowledge can only come by trial.

With band-width d, the picture strip would consist of a series of little squares, alternately black and white, the same size as the scanning aperture. The intensity-time curve would be a series of triangular waves, with wavelength $2d$, and frequency $1/2T$. The pictorial rendering would still be rather poor.

The rectangular deflection due to scanning any single broad white marking with a narrow slit is only half-a-wave, because it is all maximum, and symmetry would demand an equal duration of minimum.

Alternate black-and-white bands running parallel to the picture strips, and of the same width, would be clearly defined if coinciding with the strips, but invisible if half overlapping.

The least angular distance between bright lines of a grating allowing of visual resolution has been a subject of much past discussion. The generally accepted average value is about 1 minute of arc (·000293 radians), but it varies enormously with the individual and with conditions of observation. For a separate object, a white square on black paper subtending 18 seconds of arc may be visible. For black on white, the angle is about 35 seconds.

The writer would be grateful for an answer to the following question: Has a beam of light (homogeneous), falling on the whole aperture of a photo-electric cell, the same effect as a beam n times as bright falling on $1/n$th of the surface?

Yours faithfully,

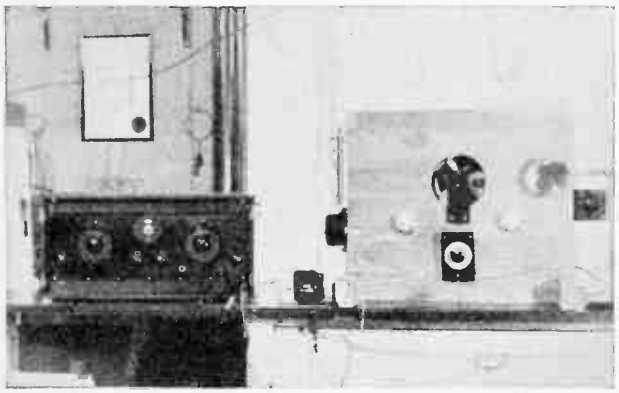
(Miss) A. EVERETT.

7 RIVERSIDE,
SUNBURY-ON-THAMES,
MIDDLESEX. *March 16th*, 1932.

NEWS FROM ITALY

To the Editor of TELEVISION

DEAR SIR,—Although my work and interest in television has by no means abated, I regret that at the moment I have nothing of importance to report. This is due to the fact that since the Baird Company's transmissions entered the official programme time of the B.B.C., they are now on the air

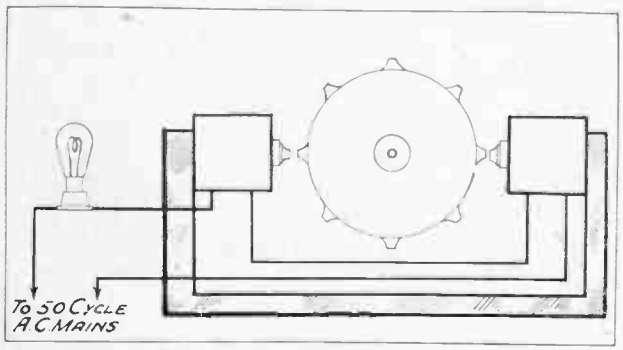


The receiver and home-made apparatus used in Rome.

during the daytime, and the original and much-appreciated experimental midnight transmissions no longer take place.

We are sure you will realise that this practically kills us at this end, for we cannot receive London during the day (except on the short waves), and looking-in is therefore no longer possible. We here, in Rome, have therefore to wait and hope that either London will soon restart the evening transmissions or that Rome will shortly do so, as has been rumoured.

In the meantime we are concentrating on the theo-



An alternative hint for finding the correct disc speed when starting up.

retical side of television, while on the practical side experiments are being conducted on low-frequency amplification, with special reference to resistance-capacity coupling, output effects on neon lamps, and neon voltages, motor stability, etc. Certainly it is only bread without the butter, but it is better than nothing.

You may rest assured that as soon as anything transpires which I judge to be of interest to your esteemed journal and its readers, I will not fail to send through a report immediately.

Yours faithfully,

R. BOCCHI.

16 VIA ALBERICO II,
ROME.
March 15th, 1932.

(Mr. Bocchi will no doubt be pleased to hear of the proposed new evening television transmission which will emanate from Broadcasting House as soon as the necessary transmitting apparatus has been installed.—ED.)

A SYNCHRONISING HINT

To the Editor of TELEVISION

DEAR SIR,—I was pleased to read in the April issue of TELEVISION that transmissions have been arranged for four nights per week, but why must the vision be broadcast on 261 metres instead of 356 metres, as in the daily transmissions? I am

A side view of Mr. Bocchi's vision apparatus, showing the neon lamp and motor.

sure others in the Midlands and north of England find, like myself, that the signals of London National are very much weaker than from London Regional. This is rather awkward, because the power is required on the vision side rather than on the sound receiver. I suppose relaying the signals to 5XX is still out of the question?

With regard to synchronising the disc; as I have not enough power to work the ordinary 30-toothed wheel, I have substituted an eight-spoked wheel (see sketch), and connected the coils through a lamp to the 50-cycle 250-volt A.C. mains. This, I find, holds the speed perfectly steady, but of course does not synchronise the disc with the transmitter, and an upward or downward movement of the picture results, but still it is very useful for finding the correct speed when first starting up.

Yours faithfully,

A. CLAYDON.

3 BILTON HILL,
RUGBY,
WARWICKSHIRE.
April 2nd, 1932.

UNSTINTED PRAISE

To the Editor of TELEVISION

DEAR SIR,—Enclosed find a postal order, for which please let me have the following back numbers of TELEVISION.

November to December 1930, and August to December 1931.

The two copies required for 1930 are those describing Mr. Barton Chapple's "Teletester," and, if I remember correctly, this instrument was featured in the November and December issues. You might kindly verify this point.

While having this occasion to write, may I say that it has been my good fortune to have had the opportunity of reading your paper for the last eighteen months, although I have only become a regular subscriber since the beginning of this year. I now wish to obtain such back numbers as will give continuity to Mr. Barton Chapple's current articles on the design of a complete piece of vision receiving apparatus.

As one taking more than a passing interest in things wireless from the amateur's standpoint, I am more than struck by the "richness" of the contributions on technical matters, my interest lying particularly in those of Messrs. Barton Chapple and William J. Richardson.

Neither treat their readers in infant-babe style so usual in some wireless papers. When will such Editors learn that it takes much hard stuff to upset the digestion of the so-called fan, and, furthermore, contributors who cannot convey a message to the beginner in an advanced article are not fit to act as nurses to this infant of science.

Again, the beginner of to-day graduates out to-morrow, and he is fortunate in having his old copies to fall back upon to glean what he missed at a first reading.

This he could never do had TELEVISION contained nothing but "talkie-talkie" stuff, as is usual elsewhere. It is a text-book.

Let's have something to get our teeth into, even tougher than before. It gives confidence, once it is mastered—not the scare some Editors think. Most readers have other sources of reference to help them out.

Hoping that all your future "visions" are rosy ones.

Yours faithfully,
H. J. GOUDIE.

P.S.—Why haven't they brought in the twenty-eight-day month, or even a shorter one? The present month seems too long for one to await Mr. Barton Chapple's next instalment of "The Instrument." More power to his elbow in the future.

55 ORCHARD ROAD,
CRAIGLEITH ROAD,
EDINBURGH.
April 1932.

Apparatus Tested

(*Concluded from page* 115)

are anxious to explore the short-wave region for stations without having to install a short-wave set complete.

New Marconiphone Moving-coil Speaker

We are advised that an addition has just been made to the range of Marconiphone Speakers. The new-comer will be known as Model "136"—a full-sized and powerful permanent-magnet speaker, housed in a walnut cabinet.

In place of the more usual rectangular shape, the cabinet has a round top with a fret similar to that of the Moving-coil Transportable Three Receiver.

The makers state that the performance of the new instrument is characterised by an exceptionally forward and "open" tone; reproduction is particularly clean over the whole frequency range, and possesses unusual depth and richness.

This speaker can be used on any receiver without alteration, as it incorporates a universal input transformer immediately adaptable to either super-power, pentode, or push-pull output.

The price of Model "136" is £8 10*s*.

CROYDON WIRELESS AND PHYSICAL SOCIETY

A LECTURE was delivered on "Light-sensitive Cells," on March 21st, 1932, to the above Society, by F. H. Constable, Esq., M.A., D.Sc., Ph.D., F.I.C., F.Inst.P.

This lecture described the early discoveries of the pioneers in this subject, and went on to trace the course of the scientific discoveries that have followed in this wide field. Both photo-electric and photo-conducting cells were described. The difference in the manner of action of these types of cell was demonstrated, and the possible applications were indicated.

Some of the apparatus which has been used for automatic street lighting at dusk, burglar alarms, counting, sorting, and race timing was described. It was pointed out that the latter applications depended on the use of a light ray as a switch, and by suitable connection of the cell to the appropriate valve circuits, a switch could be held down, as is the case of burglar alarms, or a contact could be closed for a short time, as in counting, sorting, and race timing.

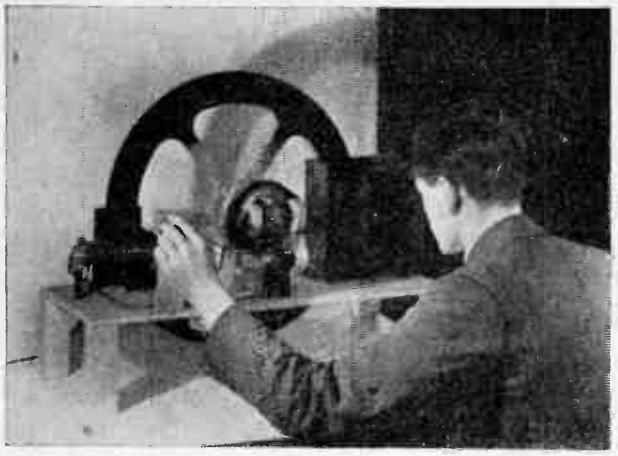
The behaviour of the various cells with the two systems for sound recording, variable density and variable area, used for talking films, was described and discussed.

An informal discussion followed, in which many members took part, and great interest was taken in the scientific aspects of light-sensitive phenomena, and in the apparatus on view.

Visitors are heartily welcomed at any of the meetings.

Particulars regarding membership, etc., may be obtained from the Hon. Sec., Mr. H. T. P. Gee, 51-52, Chancery Lane, London, W.C.2.

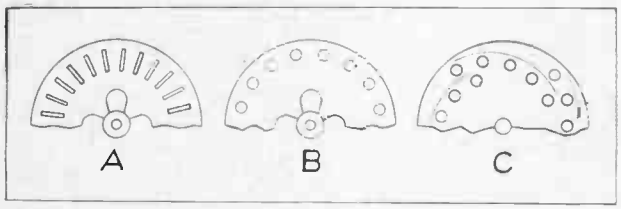
"Television's" Query Corner



QUERY:

I am going to make up some television receiving apparatus for the first time, and would be very pleased if you can help me with one or two points. I have read the TELEVISION Magazine, and gained knowledge as to the working of a receiver for television reception, but would like to know which type of scanning disc (I want to make as much of my own apparatus as possible for cheapness) is best, *A*, *B*, or *C*, and the size of the disc. I do not want it too large.

I shall use the small beehive neon lamp with a striking voltage of 100–130. I have no electric light supply, so shall not be able to use an A.C. mains motor for the disc, but I have a powerful gramophone motor, and intend to employ that to drive the disc, using the edge of the turntable for a friction drive, running the disc at a steady speed regulated by the screw to the governor. I just require a simple outfit to start with and to experiment with it. I have plenty of time on my hands and am a capable wireless fan, having made up a number of wireless sets for friends, and in addition understand the theoretical side. Hence my desire to have a shot at television.



The three types of scanning-hole arrangement suggested by our correspondent.

Some people say that the science is not far enough advanced to bother about, but I think that if more people took it up seriously, something may be found that would be of very great value to television for use in the thousands of homes benefiting by such a wonderful invention.

Is there any set distance between neon lamp and disc, disc and ground-glass screen? I suppose I can use a magnifying lens or lenses within limits to enlarge the image?

A. N.

REPLY:

We are very pleased to note that you have decided to take a practical interest in this wonderful science of television. With reference to the scanning disc, if you are receiving the normal transmissions, as at present sent out by the Baird Company, then only one type of disc is suitable for this purpose. This consists of a thin aluminium disc made up from about 34 S.W.G. aluminium, having a series of square holes arranged in the form of a spiral near the periphery of the disc.

Each hole has an equal angular displacement of 12 degrees from its predecessor and must be constructed accurately if the best results are to be achieved. In this connection may we therefore refer you particularly to the following back numbers of our magazine, as in these issues the question of disc construction is dealt with: July 1929, December 1929, January 1930, and March 1932.

The best average diameter for the disc itself is 20 in., and you should secure quite a good image in conjunction with a small neon lamp. In last month's Query Corner page we dealt at length with methods which can be adopted in order to secure a uniformly bright field when employing a neon lamp of this character, and we feel sure that those notes will prove of service to you.

While it is always best to have a direct drive for the disc, we see no objection to your making initial experiments in conjunction with a powerful gramophone motor, using the edge of the turntable for a friction drive. Steps will have to be taken, however, to ensure that there is no suggestion of slip and that the exact speed of the disc is 750 revolutions per minute, the rotation being in an anti-clockwise direction.

The neon lamp should be mounted on the right-hand side at the back of and as close to the disc as possible, the centre of the lamp being in a horizontal line with the disc shaft. In front of the disc should be placed the magnifying lens or lenses, so that the image can be enlarged to suit your own tastes.

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