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Name
Address
DAME ENID L. LYONS, whose appointment to the Australian Broadcasting Commission was announced recently, celebrated the occasion by condemning the practice of devoting almost the whole of Saturday afternoons to sporting broadcasts. With this opinion I heartily agree, not only as it affects the ABC but all other stations as well.

It may be that the large majority of Australians are interested in sport. But it isn’t so important that, because of a virtual monopoly of the ether on Saturday afternoons, no one can tune in to a decent musical program. Even if sport is the major attraction on Saturdays, does that justify five or six simultaneous broadcasts of the same race? I cannot think so. And neither can thousands of others.

We will not achieve a balanced broadcast system until some co-operation is established between broadcasting interests as a whole. One of the difficulties is the desire of each commercial station to hold as many listeners as possible at any one time to provide an audience for the appeals of the advertiser sponsoring the broadcast. It is a legitimate result of commercial activity, but it can be taken too far.

I’m not making the point that commercial stations are a bad thing. Every system has weaknesses, and we must do our best to overcome these. If Dame Enid can do anything to bring her ideas into practice, she will have plenty of grateful listeners.

And while she is about it, she might see whether the Parliamentary broadcasts can be rationalised. The ABC is in a spot about these, for it has a legal obligation to keep them on the air. Recently thousands of listeners were disappointed to miss a particularly fine concert from the Sydney Town Hall in which Thalben-Ball gave a magnificent performance. The Senate decided to sit until 10 pm that evening, and its proceedings had to be broadcast. Ironically the broadcast was one of the least edifying I have ever heard. It consisted of arguments on procedure, about five divisions, and exactly nil business being transacted.

At 10 pm the ABC broadcast a recording of the concert, and a good one, too, but most listeners who wanted the concert had gone sorrowfully to bed.

If Dame Enid can help extricate the ABC from some of these difficulties, she will be doing a good job.
Make No Mistake!

Start off your new year, master, with Paton! Men of judgment come in Patons. They are the best evidence of economy and patience.

Paton Electrical

Patent No. 1,234,567
In any case it helps cartoonist Eric Porter to find the right expression for his character "Willie Wombat." Porter is one of the few Australian cartoonists preparing original material for the films. He makes them mainly for advertising and for some Government departments. Some of the secrets which have helped Disney and others to fame and fortune are told in the following pages.
CARTOONS ARE HARD WORK

In the 1900's one glance at the picture theatre the monochrome of the newsreel gives way first to color and then to animation. A stif silence through the auditorium, a mixture of anticipation and a bit of the happiness of the news of the day — the King of the Silly Symphonies, Donald Duck, hits the screen.

How can one explain the truly universal appeal of the animated cartoon? Mr. Everyman might answer, "It's just that we are all kids at heart" — and this is true enough. But a psychologist would go on to add that it not only helps us temporarily to forget our worries — as, indeed, do practically all films — but also provides a welcome change from even the make-believe troubles of the ordinary screenplay characters. For they often either inadvertently remind us of our real life worries or, because of their skilful acting, enable us to realistically identify ourselves with them and the harrowing experiences they suffer before they reach their happy ending.

But the cartoon does more than this. As its zany situations develop with lightning speed, taking one utterly unexpected turn after another, as its characters suffer and perpetrate incredible violence, we in the audience experience a release-by-proxy of all the suppressed since childhood desires for mayhem and destruction that are part of the make-up of every normal man and woman. The makers of the animated cartoon know this and naturally exploit it.

Seems incredible, but McCay was apparently a glutton for work, for, following the success of his first effort he almost completely abandoned newspaper work in favor of his new medium. No doubt the fact that he could make much more money by doing so had a lot to do with it. In any event, McCay went from strength to strength and in 1918 produced his masterpiece. This was called The Sinking of the Lusitania, a cartoon requiring 25,000 separate drawings, a job that took him 22 months!

Other men were quick to follow the successful lead of Blackton and McCay, and, in the following 20 years the animated cartoon developed into the technically perfect product we know today.

Undoubtedly, if any one man is to...
be credited with his present devotion to this field, that man is Walt Disney. Disney's is a story in the true rags-to-riches Hollywood tradition. He began life as a farm boy in Missouri where, no doubt, he knew and loved the many animals which were later to people and popularise his cartoons around the world. When Walt was 10, his family moved to Kansas City. Here Walt delivered papers before school each day to assist the family budget. Not unnaturally, his school books were full of sketches and he developed a trick of drawing people in graduated poses on succeeding pages, rapidly flipping the pages gave a crude but effective illusion of movement, a device familiar in every school child today. In his 17th year, Disney managed to secure some art training at the Chicago Art Institute.

The typical team comprises: 1. Director; 2. Musical director; 3. Two or three senior artists to create the leading situations; 4. The layout man; 5. Scenario writer; and 6. A group of artists who usually split the work three ways: a. Animation; b. Inking (the transfer of the animals' drawings to transparent sheets); and c. Backgrounds. When a story idea has been decided on by the studio heads, the gay artists, whose job is to work with oil the funny situations in the story, are called in with the director, the musical director and the team of artists for a round-table conference. The upshot of this meeting is the creation by the artists of the whole story in the form of a series of leading comic situations, sketched on paper. The scenario writer also prepares a definitive story outline at this point. The director and the music leader then get together, discuss the cartoon's inception. Normally, due to the peculiar nature of the musical involved, it is extremely difficult to achieve complete musicalities—. In such a case, the music must then be fitted to the story. One episode of a certain mood may last only a few seconds, ranging from a few to perhaps fifty. The music must then be chopped to fit—to the split.

RADIO AND HOIStES FOR AUGUST, 1935

PAGE 156
EVERYTHING FOR THE PROFESSIONAL AND NON-PROFESSIONAL RECORDIST.

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Suitable for R-12-D and R-154 Recorders.

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Suitable for 10" and 12" turntables.

Available in six sizes of paper.

FREE!
These "cells" are the heart of the whole animation process. They save a tremendous amount of work since (the background is visible through them, except for the part occupied by the characters, of course). The background, therefore, need be drawn only once for each scene. As can be seen in one of the photographs, a "multi-plane" setup is used to give the illusion of depth to the picture. In some of Disney's later epics, as many as five different planes, all moving in correct relation to one another, were used to achieve a remarkable realism.

The cameraman has an important job requiring a considerable amount of patience, since each cell must be photographed individually a frame at a time. Initially the background and the foreground can be painted on long sheets of glass and these are moved a fraction of an inch in a predetermined ratio as one cell follows another.

MUSICAL EFFECTS

Thus is the story told to the image. Meanwhile, the orchestra, augmented with a formidable array of special instruments, has recorded the music and sound effects on a separate medium (film, tape or wire). Given the image score and a few rehearsals, split-second synchronisation is a relatively simple matter.

The dialogue can be recorded at the same time and on the same track as the music, but is usually made earlier so that a separate track can be made available to the animators for "lip-syncing" (matching mouth movements to the speech). The various tracks are then "married," i.e., brought together by an ingenious machine called the optical printer. The resulting film, usually a master negative containing both the image and the complete soundtrack, is then used to make as many release prints as required.

Here in Australia many people have made animated cartoons in the past and some are still active in this field. One of the most modern layouts is in a small studio at Bexley North, near Sydney. Run by Erie Porter, who will best be remembered by regular film-goers for his feature film "A Son is Born," it is the scene of a regular output, of cartoon shorts in Technicolor for the trade, some Government departments and commercial advertisers.

Some of the past including those of Caruso, McCormac, Orlne, the Poole and Paternoster recorded under old processes, are now being released in albums on microgroove records by the Victor company.

STUDIO SET-UP

Porter at one time had a staff of 28 artists and artisans working for him, but found that the running of a large organisation divorced him too much from the actual artwork. He is one of that peculiarly twentieth-century breed of men, an artist-technologist, and dearly loves to tinker working out new methods.
Announcing... The New ROLA Model 12-OX

Specifications

- Frequency Response: 10-15,000 Hz
- Sensitivity: 87 dB
- Power Handling: 100 watts
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ROLA CO. (AUST.) PTY. LTD.
The Boulevard, Richmond, Vic. Phone JA 5351
116 Clarence St., Sydney, N.S.W. Phone BX 39961
An employee at a factory making jet-engined planes was recently reported to have "gone sick" as a result of the noises—the first case of what has been christened "supersonic sickness." We may all live to hear more of this strange melody.

Another application of the principle is to discover the presence of shoals of fish. The fish reflect the vibrations and record their presence many fathoms below.

It was when scientists learned to frequencies that really spectacular results were obtained. The normal range of sounds we hear run from 40 to 4000 vibrations a second. The limit of human hearing is generally reckoned at 10,000.

Certain animals can hear what for human beings are "ultra-sounds." A whistle can be made, for instance, which is completely inaudible to the person blowing it because the sounds generated are beyond the range of his ear, but which will summon a dog whose ear is built to hear higher sounds.

The supersonies to which I have been referring are generally in the range below 100,000 vibrations a second.

They may be generated with the aid of a rapidly alternating magnetic field. The alternations produce tiny alterations in the length of a piece of metal in the field, and this in turn creates alterations in the pressure.
The range of UNIVERSITY EQUIPMENT includes:

- Signal generators
- Super testers
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FINE TEST GEAR THAT YOU CAN BUILD YOURSELF

in kit form these instruments cost only a fraction of the assembled price.

MODEL MK1 MULTIMETER KIT

This A.C./D.C. Multimeter Kit comes to you complete with everything right down to the last nut and bolt. It is carefully engineered and designed and all Resistors, Meters, etc., are carefully pre-calibrated in the Factory to an accuracy of 1 per cent. Thus when you complete building this instrument there is no further calibration necessary. It has a wide range of A.C. and D.C. voltmeters up to 1000 volts and current can be measured in the following ranges:

- 10, 50, and 250 Milliamperes.
- Resistance readings up to 100,000 ohms.

It is entirely self-contained for resistance readings which are up to 100,000 ohms.

MODEL OKI OSCILLATOR KIT

For years of active service, yet simple to build at home with a few ordinary tools, Model OKI Oscillator Kit covers all fundamental frequencies in the average receiver. It comes to you complete with everything right down to the last nut and bolt and assembly can be done at home with a few simple tools. The Dial, Condenser, and Cathode are pre-calibrated in the Factory so that no further calibration is necessary when you complete building this instrument.

Standard Batteries are used and each OKI Kit is complete with an Instruction Book which gives diagrams of all parts and in addition gives full operating instructions for using the Oscillator to the best advantage when you have finished it. It is carefully packed and all Metal Parts are pre-calibrated so that no heavy work has to be done. Please is simple yet effective and simple in its use, it makes an Ideal Portable Battery Oscillator for the Serviceman or Home Builder.

Made by UNIVERSITY GRAHAM INSTRUMENTS PTY. LTD.

5 North York St., Sydney, B.UB 169 (2 lines).
A new portable television camera and transmitting station, designed to operate in the field as a one-man back-pack unit, was demonstrated recently by L. E. Hory, of the RCA Laboratories, at a meeting of the Institute of Radio Engineers USA. The equipment contains 42 tubes which, with their associated circuits, provide all synchronising frequencies for a standard 525-line, 30-frame interlaced television picture. Included in the unit are the battery-operated power supply, detecting circuits, amplifiers, and a radio receiver for receiving instruction and other essential information from the control point. A single battery operates the portable station for about 1½ hours.

The narrator-cameraman's voice is picked up and transmitted through the combination of a small microphone built into the camera case and an ingenious electronic circuit which adds the voice signals to the picture signals as they are radiated to the control point. Research and development of the portable television equipment were

Sound we cannot hear

(Continued from Page 9)

the cells affected.

Other effects of supersonic vibrations which have been noted are chemical. It has been found that crystallisations may be started by ultrasonic vibrations and certain chemical reactions may be accelerated.

A notable instance was the production of an isocynale from acid azide. The azide was dissolved in benzine and subjected to high-frequency sound. The atoms within the molecule were rearranged, although the exact process by which this was done is not understood.

More recently Dr. Pierre Grabar, of the Pasteur Institute, has been successful in breaking down the "benzine ring," the closed ring of six carbon atoms which is the fundamental building block in organic chemistry, the basis of everything living.

The commercial application of supersonic is in its infancy, and there may be interesting developments. Laundry work is one example of tests now being undertaken. At the moment there is again a certain amount of concern whether high-frequency sounds generated accidentally can affect human beings in laboratories.

The possibility of this doing so "in the open" can probably be ruled out — if a jet plane passing overhead was generating high-frequency audible sounds it is doubtful whether they would have sufficient energy to reach the ground.

The possibility of this doing so "in the open" can probably be ruled out — if a jet plane passing overhead was generating high-frequency audible sounds it is doubtful whether they would have sufficient energy to reach the ground.
METEORS: BOMBS FROM BEYOND

It has long been suspected that the regions of the upper atmosphere hold the secret of existence. Scientists tried for ages to penetrate into the outer recesses of this heavenly canopy but it is only in recent years that much progress has been made in really finding out just what exists above our head.

It must not be supposed that our atmosphere exists merely for the purpose of breathing, conveying sound waves and raining. Now, it exists, solely for the purpose of propagating radio waves.

To most people, a look into the atmosphere, beyond a few clouds, few birds and a lot of atmosphere, appears to be entirely empty of anything which can be construed as having the remotest connexion with life itself.

Yet this region and especially that beyond the atmosphere proper, is packed with most peculiar and awe-inspiring forces.

**COSMIC RAYS**

Great bearing on the propagation of radio waves.

The outer regions contain vast clouds of cosmic dust from exploded stars and other heavenly bodies. It has never been settled whether the temperature beyond the atmosphere is hot or cold.

Some observers claim that, at about 100 miles up, the temperature is in the region of 1700 degrees F. Others claim that the heat is not the kind of heat with which we are familiar at all. That it is, in reality, a form of electrical activity of which we have had no experience but which "burns up" anything which comes within its influence.

Meteors which rush in from outer space strike this curtain of "heat" and burst into a consuming flame which completely obliterates the meteor. Some observers believe that the larger ones are pushed out of the regions that we expect to find life.

**EVIDENCE OF HEAT**

For instance there are deadly rays which could penetrate our bodies and bring about the end of life on earth were it not for the beneficent protection of the atmosphere.

There is intense electrical activity which causes such phenomena as the Aurora Borealis and Aurora Australis. This activity has a very

**by Calvin Walters**
of peace—while there is "peace"—

Such facilities include the V2 rocket

and has been sent up well over 100

London. This fearsome weapon has

upper air we are learning more and

appearance as much as 48 hours prior

out of an income tax return in a meteor,

It is true that the universe itself is changing and is not the

It is not only the atmosphere which

It is true that we can do nothing

- the complete destruction of civil-

traces dangerous radiation to the

“discovery" was not confirmed. Perhaps he confused his

incredible to every-day earth

unfamiliar to every-day earth

than it is to find out what exists far

radio and hobbies for August, 1935

A meteorite that with a handy camera produced this picture of a meteorite in Mexico

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STROBSOCOPES To check your gramaphone speed 6d.
The latest of the so-called semi-conductors to make the news is cadmium sulphide (CdS), which promises to become an important research and industrial tool because it can be made a very sensitive detector of various types of radiation. It will be especially useful for high-speed automatic x-ray inspection of industrial products.

The CdS crystals also emit a red glow when irradiated. The crystal holder is separate so the instrument can be used by turning the cylinder so the crystal is in front of a small window. A small cylinder inside the holder takes several crystals, and any one may be selected for use by turning the cylinder in front of a small window.

This detector can be used for detecting X-rays, light, etc., and there are no moving charged carriers to make it unstable in the crystal lattice. There is only a small change in conductivity in the CdS crystal when it is excited by radiation. The crystal is that it begins to heat up when too much current flows, and it stops working. Generally the persistence of the glow varies from crystal to crystal. In some insensitive crystals the conductivity may decay within a microsecond after excitation stops, while in sensitive crystals the decay time may be measured in seconds or even minutes. In crystals where the photo-current is not proportional to the applied voltage, the sensitivity depends largely on the amount of excitation energy.

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The fact is most important, because the reason for this unusual optical and electrical behavior of these crystals is different from other forms of matter because the atoms which make it up are arranged in orderly geometric patterns.

When the crystal is not excited by radiation, the electrons are firmly bound to the atoms within the crystal lattice. During this high-energy state, each electron that leaves the crystal at the anode is replaced by one that enters at the cathode, so that the amount of current depends on the number of electrons that are in the excited state. After a time (depending on the concentration of defects in the crystal) the electrons return to their normal state. In this process they lose up the energy which they picked up during excitation, and energy which they picked up during excitation, heat is emitted as heat.

The instrument could be made automatic x-ray inspection of industrial products: for some distance from the actual point of measurement to protect the operator from harmful radiation. This gives even this pocket instrument an extremely wide range.

This detector could be made even more sensitive by using a higher-voltage battery. The only thing which limits the amount of voltage that can be applied to the crystal is that it begins to heat up when too much current flows through it.
THE Solution for removing instantly resistance in all Electrical contacts, switches, relays, etc., WITHOUT DISMANTLING

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- Speakers supplied are Magnavo 12" and 8" permanent magnet with tropic proof transformer. Single 12" supplied with 6 valve chassis
- Large calibrated edge III dial in plate glass (11" x 7") with main stations In each State in prominent type, fitted with couplerweight drive and supplied with polished esculcheun
- Indicator lights on dial showing which band in operation

6 VALVE WORLD-RANGE CHASSIS
SPECIFICATIONS AS EIGHT VALVE UNIT, BUT WITH SINGLE SHOT OUTPUT VALVE AND SINGLE 12" SPEAKER
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RECORD-CHANGERS AND PLAYERS

Collor, Consort & Plessey Players with Crystal or Magnetic Pickup Available, also Limited Quantity of Automatic Changers

Large Variety of Combination and Console Cabinets Available from £14/-/
relay operation are important features made possible by using two connections enabling them to pick up directions. This type of operation enables communication to be established between two stations separated by high ground by having two relay sets located on the intervening elevation.

The RF mixer and oscillator circuits are individual sub-assemblies consisting of decoupling resistors, a small coil, capacitors, and a sub-miniature tube and socket. Each sub-assembly is located in a small box. The antenna coil is common to both transmitter and receiver.

Each IF amplifier sub-assembly includes the tube and is hermetically sealed in a can about 1 inch in diameter and 2 inches long. The cans are made with 7-prong plug bases which plug into sockets on the chassis.

Two types of antennas are provided with each equipment. For maximum range, stationary use, and two-way unattended relay operation, a seven-section whip-type antenna is used. Each section of this antenna fits into the ferrule of the previous section. To protect the long antenna from damage if it should strike an object, a spring-section is provided.

A discriminator and a single audio stage feeding the handset receiver. When no signal is being received and the squelch circuit is turned on, the discriminator output is shorted by a relay operated by the squelch tube. This tube is controlled by the grid voltage of the last IF limiter. The grid voltage cuts off the squelch tube, releases the relay, and thereby removes the short on the audio input. The equipment is calibrated by two crystal-controlled oscillators. The constant-frequency output of one oscillator feeds into the antenna coil. Certain harmonics of this oscillator frequency beat with the intermediate frequency of the second calibration oscillator to produce a calibration signal.

PERFORMANCE FIGURES

The receiver sensitivity is 0.5 microvolt with 2.5 mw output. 15 ke deviation and a 10-db signal-to-noise ratio. Selectivity is 80 ke at 1 db down. A received signal is resonated in both the antenna and the antenna coil and then amplified in the two RF stages, gang-tuned to the operating frequency. The amplified RF signal is fed to a mixer stage together with the local oscillator signal to produce the intermediate frequency in the plate circuit of the tube. Five identical cascaded IF stages follow the mixer and are connected as grid limiters, if the signal from the mixer is strong enough, the IF stages operate as cascade amplifiers.

Following the five IF sections, the signal is fed to a discriminator and a single audio stage feeding the handset receiver. When no signal is being received and the squelch circuit is turned on, the discriminator output is shorted by a relay operated by the squelch tube. This tube is controlled by the grid voltage of the last IF limiter. The grid voltage cuts off the squelch tube, releases the relay, and thereby removes the short on the audio input. The equipment is calibrated by two crystal-controlled oscillators. The constant-frequency output of one oscillator feeds into the antenna coil. Certain harmonics of this oscillator frequency beat with the intermediate frequency of the second calibration oscillator to produce a calibration signal.
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Instrument makers — £12/17/0 per week
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Domestic and benefits include — free overalls, 3 weeks' holiday every 12 months on full pay, liberal cumulative sick leave, excellent food service cafeteria, casually service and convenient transport facilities.

Applications should be made personally or in writing to the Staff Industrial Officer, Ammunition Factory, Footscray (Vic.). Tel. Fl 022, Extension 145.
A great organist

Q: What is meant when a substance is described as being elastic?

A: Elasticity is the ability of a substance to return to its original shape after it has been deformed. If you take an elastic band, stretch it, and then remove the stretching force it will return almost to its original condition. If you had some accurate means of measuring it you would find that there had been some permanent deformation of the rubber.

Q: If you drop a stone from a building, what happens to the energy that was used in carrying it to the top of the building?

A: The question arises from the principle of conservation of energy which states that energy can neither be created nor destroyed but only changed in form.

Q: What do the weather men mean when they say that the humidity is 100%?

A: Unless special laboratory precautions are taken to make it otherwise most of the air on the earth contains a certain amount of water vapor. Naturally the amount tends to be greater near the coastal regions and over the sea. When it is raining the amount of water-vapor along with liquid water, obtained in the form of rainfalls.

Q: How is the air humidity measured?

A: For instance, you could say that the humidity is 100% at the top of the building.

Q: Why is the relative humidity quite distinct from the amount of water vapor present in the air?

A: Relative humidity is quite distinct from the amount of water vapor present in the air.

Q: What is meant by elastic substances?

A: Elastic substances are defined as those which when subjected to external forces do not change in form at the higher temperature.

Q: What is meant by plastic substances?

A: Plastic substances are defined as those which when subjected to external forces do not change in form at the higher temperature.

Q: How is the amount of water vapor in the air at the particular time quoted in the weather reports?

A: For instance, you could say that the humidity is 100% at the top of the building.

Q: What is meant by mechanical energy?

A: Mechanical energy is the energy possessed by the object in motion.

Q: What is meant by chemical energy?

A: Chemical energy is the energy which comes from the food he eats and the air which he breathes.

Q: What is meant by potential energy?

A: Potential energy is the energy possessed by the object at rest.

Q: What is meant by kinetic energy?

A: Kinetic energy is the energy possessed by the object in motion.

Q: What is meant by internal energy?

A: Internal energy is the sum of the kinetic and potential energy of the object.

Q: What is meant by specific energy?

A: Specific energy is the energy possessed by the object per unit mass.

Q: What is meant by thermal energy?

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The serving eye

CONCEIIN is expressed in the US that the televising of important hearings and court proceedings is having an adverse effect on them. It is claimed that a biased impression is obtained by the television audience which might see only part of what goes on. Those engaged in the proceedings are at a great disadvantage in having to worry about what the outside world sees and hears.

Moreover there is the legal aspect—whether or not it is an infringement of personal rights so to televise a citizen without his consent while undergoing the strain of appearance. Many prominent people object most strongly to the invasion of being caught by the roving eye of the television camera when they do not know about it. In this respect the camera is in quite a different category from the microphone, for it is quite practicable to televise from a hundred yards or more with good detail, and no notice.

Recently one of the Royal Family was caught by a television camera while surreptitiously scratching herself at a race meeting. Many consider that such things might, under certain circumstances, be the basis for a libel action.

To a certain extent, the invasion of radio into our Parliament has not been altogether a good thing. Many speeches have been given purely for the benefit of listeners and (bo desirability of making an impression on an electorate, rather than to contribute anything useful to a debate. And many of the incidents which have gone over the air have unquestionably reacted strongly against the dignity of the Parliament.

What might happen when a television camera is installed only the imagination at present can estimate. Nor is it certain that even Parliamentarians should be subjected to the ordeal of being projected into thousands of homes, sometimes without their knowledge.

At the present time it looks like a major headache for television in the USA.
As I had expected, the reference in the June issue to aural distortion, beat notes and the like, brought forth a deal of comment, most of it along anticipated lines. One letter, however from Mr. J. F. McDermott, did cause a furrowing of the brows. What arises from it all, has only a second-order connection with radio theory but, that maybe isn't a bad thing for once.

At first reading, I might well have reacted like a certain well known character. "Oh. I say. I am a fool." However, after re-checking a few ideas, I have reason to hope that I mightn't be one after all. Evidence to the contrary notwithstanding! At least, I ha...
In the face of that, I feel about as guilty as someone who has inadver-
taneously. Faster beats appear as
ences tones may be produced in any
ger the frequency difference between
v a c u u m - I u b e amplifiers, by
an intense sound in the air, in the
non-linear system as, for example,
force being different in magnitude
element is assymetrical, the restoring
power of the displacement. If a
vibrating system have been con-
restoring force of the elements of a

COMBINATION TONES

Combination Tones and Non-linear Transformers—In most of the
ear structure itself. It may well be
stimuli would result from the same
ate distortion at the sound source,
even though the distortion may not
be obvious as such.

Well really, sir, I must protest.


tone" which will beat with an

RADIO AND HOBBIES FOR AUGUST, 1951

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TWO WINNERS FROM ELECTRONIC PARTS

Whether it is a marvellously compact car radio, or a world range radio, Electronic Parts have complete guaranteed Kits in their long range of over 50 high-class units.

KAR-SET. This neat compact car radio, designed by "EB & H" for either 6 or 12 volt operation, is only 5 valves, but has performance equivalent to that of a 6 valve set. It is finished in the latest brocade process and comes complete, down to the last nut and bolt.

Below are illustrated just a few of the sets available in kit form. Send coupon for a free catalogue in which more than 50 high-class sets are listed; in addition to those already mentioned, many others are available such as:

- Vibragram 7.
- Sensio, Radiogram.
- Beginners Kit.
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- Majestic Radiogram.
- Carry-Set.
- 1957 Advance.
- Vibra A K L.
- fidelity 5.
- 10 Band TRF, Etc.
- Superhet Tuner.

Send for details now!

Electronic Parts Pty. Ltd.,
206 Broadway, Sydney, N.S.W.
The answer cannot simply be "from between approximate musical intervals."

Mechanism to account for beats beyond 200 cycles per second requires you have to explain some other order effect. We can budge from the assertion that the original sound will modify the result within the aural system, and you will be heard between apparently pure waves.

Thus 604 minus 600 equals 4 cps. Beating rate equals 2 x 302 - 3 x 200 = 4 beats/sec. This is a simple case, why should we hear a beat between two tones which form an approximate octave?

By normal calculation, the only combination tones formed by a tone 200-cycle note and one at 600 cps would occur at 62 and 580 cps. Far away the most obvious effect is that the beat cycle is not a few cycles per second, Where gone wrong all of a sudden? Are we up against the old bogey of "theory v. practice".

I would suggest that the low frequency. It is an elevated to a point of interaction between the fundamental versus output of two sine wave oscillators.

Set both to produce equal amplitude. Tying it together, one at 400 cps and the other at 600 (600 cps) to produce a beat at the difference frequency. Thus 604 minus 600 equals 4 cps.

Putting the other one, second note of a harmonics of 312 cps (at 614 cps) with the third harmonics of 300 cps (600 cps) to produce a beat at the difference frequency. Thus 604 minus 600 equals 4 cps.

And where do the harmonics present in the original sound come from? If a tone is added, the harmonics are produced within the aural system, and you will be heard between sounds closer and closer to the original note.

Harmonics may represent present in the original sound will modify the result further, they represent only a second order effect. It can be imagined a retort in all this. "But old chap, that's all very well, ma'am. I don't want to hear distortion!"

To the listener, however, the aural system is easily analyzed by the aural senses. It is not for the conventional ear to appreciate Eastern music on the other hand, or modern European music on the other but who can say that it isn't pleasant listening for somebody?

PROBABLE REASONS

Of course, there may be physical or physiological reasons why we are ready to classify chords as consonant or dissonant. A simple octave relationship C-C is a relationship between the fundamental harmonic at 400 cps and an octave at 200 cps. The only satisfactory answer is that the harmonics are produced by the operation of the 400-cycle harmonic oscillator and the 200-cycle harmonic oscillator.

A great deal more could be said along this line, but I will leave it to someone else to take up. It's an interesting enough problem to me will leave it for someone else to take up. It's an interesting enough problem to me to wish to hear produces a beating note slightly off pitch from the one used, a beating note which disappears when the original note is added, many of its harmonics are produced within the aural system, and you will be heard between sounds close and closer to the original note.

Another objection to the psychological approach is that our reaction to music, harmony and dissonance is influenced by the difficulty for the conventional ear to appreciate Eastern music on the one hand, or modern European music on the other.
two of the best.

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Check these outstanding COLLARO advantages against any other record-changer.

1. With only three moving parts the COLLARO 4.
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4. Unbreakably light needle pressure.
5. Plays straight or 10 or 12 as selected.
6. Modern styling simplicity...
7. Modern styling simplicity...
8. Modern styling simplicity...
9. Modern styling simplicity...
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The best on record...

Also available in straight and midget lightweight types.

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52 Bowan St, Kew, B1818.
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240 VOLT A.C. MAINS OPERATED

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Supplied ready for use with 2 pairs of power leads at.

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5" Tin Snips wth 21" highly polished cutting blade. 32½ in. in high quality steel. Black painted handles. Suitable for shearing metal. £2.90.
Eliminate noise through feed back from power mains

Improve tone quality by fitting the latest

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LINE FILTER

The well-known R.C.S. line filter is cut in on your power line and specially designed and constructed to eliminate all noises caused by feed back from power mains, electric motors, elevators, household electrical appliances. The R.C.S. line filter is wound to strict P.M.S. specifications, and is built to the highest R.C.S. standards. It is as easy to install as fitting a three point plug, yet its results have been pronounced by many users as amazing. Be "certain" of the finest tone quality from your set by first filtering your "juice" by fitting the R.C.S. line filter, L.F. 20.

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IF your local retailer cannot supply, write R.C.S. direct and we will arrange for your retailer to receive stockist immediately or advise you where the components you require can be obtained.

Budget Magnasonic Coil

Trimming condenser.

Resistor.

Standard broadcast coil.

P.M. coil.

H bonded coil.

RADIO AND HOBBIES FOR AUGUST, 1956
THE drive system for a magnetic recorder may fall under one of three general headings—variable, pseudo-constant, and constant-speed, the adjective describing in each case the actual travel of the medium. The first two are commonly employed in wire recorders and are worthy of mention, if only by way of contrast. The variable-speed system stems from the practice, on some wounded drums, of winding the wire off from the supply spool to a similar spool, the latter being driven at a constant rotational speed of winding the wire from one small drum through a slipping-clutch system, as is common practice. Uneven take-up can occur with a badly governed machine, which may or may not be serious, according to the nature of the recorded programme. In a tape machine likely causes variations, which produce effects known commonly as "wow" and "flutter.

The "wow" effect is a slow periodic variation in pitch, of the type which occurs with a badly synchronized speed. With an appropriate drive ratio such as a motor can be relied upon to maintain at least the correct nominal tape speed. It is still necessary, however, to take precautions against short-term speed variations, which produce effects known commonly as "flutter".

The pseudo-constant and constant-speed systems are applicable with music and are readily noticed.
With quality as the prime factor, A & R products are developed to give lasting and highly satisfactory performance. We market our transformers to satisfy the needs of the customer who buys on value and not on price.

As present the accent is again on high fidelity audio reproduction and with the advent of wide range disc and tape recording together with pickups and speakers, better-class equipment is required to fully utilize these wide range components.

Aware of these requirements, we have for quite some time been manufacturing wide frequency range audio transformers for almost every purpose. Our catalogue of transformers and Reactors which may be obtained on request gives a large selection to choose from; whether the requirements be for Audio, Radio, Theatre, Domestic or Industrial use.

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Loudspeakers and Microphones suitable for use with the above equipment also available.

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AND FROM ALL LEADING RADIO SUPPLY HOUSES.
Figures 2, 3 and 4, illustrating possible arrangements for single track, twin track and "flip-flop" twin track systems.

The tape drag against the side of an uncoiled reel.

Flutter is a very rapid speed variation which tends to impart a roughness or harshness to musical tones.

The most prolific source of flutter is vibration and unevenness in the capstan or capstan drive system, so is vibration and unevenness in the tape travel is modulated in roughness or harshness to musical tones.

The tape must be held firmly against the magnetic gap, at precisely right-angle thereto.

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In the very least a fast rewind facility for fast forward must be preferred, of course, commercial machines come equipped therewith. With fast forward and loaded normally for play.

Ideally, a recorder should have sufficient take-up spool, so arranged that the tape can very easily be snapped. This is especially likely with large, heavily-loaded reels.

The point is often made that twin-track recording is more frequently interested in playing excerpts from longer works. If the tape is moving only slowly, it is usually possible to reverse its direction abruptly without complication.

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The translation of these basic mechanical requirements into practical reality has tested the ingenuity of commercial recording designers and not all their schemes have been above criticism. However, knowing the basic requirements, the construction of a tape drive mechanism should still be within the capabilities of home constructors with mechanical training and facilities. A major difficulty, at the moment, is that of design, since blueprints and plans for a complete fabrication are not commonly available—at least to that degree.

RA C ON 10 TIMES FOR AUGUST, 195.
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**ESTABLISHED 30 YEARS**
The preferred method is, of course, to construct a tape deck as a complete unit. It is not only easy, but also delightful the supply of such components can be taken to, degree they will be standardized, or how their price and performance will appear. It is probably "Rolls Royce"IRS being the position particularly from the home constructor's point of view, and will describe home-made gear just as some such or other something, something, something, which readers might reasonably dup-

MANUFACTURED UNITS

In the meantime, it is likely that the first model in the line will be the release of "tape decks," and one or two models have already been announced. A tape deck will be sold as a home-constructor kit, much the same way as the conventional record player, and will normally include every car-assembly, control and control facilities and whatever magnetic heads the manufacturer regards as optimum. It will be up to the home constructor to provide the suitable circuits for recording and playback, and to house the lot in a suitable cabinet. Though the suggestion can only be speculative, it would appear that the price of a good average tape deck will run around the £40 mark.

The first and simplest variety, which readers might reasonably dup-

INSTRUMENT CASES

With a few brackets and pulleys one could construct a complete unit in much the same way as the conventional record player, and will normally include every control and control facilities and whatever magnetic heads the manufacturer regards as optimum. It will be up to the home constructor to provide the suitable circuits for recording and playback, and to house the lot in a suitable cabinet. Though the suggestion can only be speculative, it would appear that the price of a good average tape deck will run around the £40 mark.

The first and simplest variety, which readers might reasonably dup-

rator mechanical facilities. It be home-constructed without elab-

Figure 2 illustrates a likely lay-out for a single track tape deck, which is so arranged that the tape is pulled past the magnet head in the cut off the supply reel.

For rewind, the tape is slipped off the capstan and run straight across the deck. It is highly desirable to disregard the tape during rewind, both to avoid wear on the tape and more particularly on the surface of the magnetic heads.

As already emphasised, the drive to the capstan must be absolutely smooth. So constant, that once the tape has run off the supply reel, the motor must be driven at a uniform speed in the reverse direction for rewind.

The vital point is always the question of how best to drive the various systems. The clutch can take various forms, but experience seems to indicate that dry contacts, which are more reliable than "wet" clutches, are superior in all respects, atmospheric conditions.

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INSTRUMENT CASES

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The preferred method is, of course, to construct a tape deck as a complete unit, with its own drive mechanism meeting the requirements already listed. The component parts can be arranged in a variety of ways, and the simplest approach, from the reader's point of view, is probably to describe two or three typical systems.

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FIGURE 1: SHOWING THE SECTIONS WHICH CAN OCCUR IF THE TAPE DOES NOT MAINTAIN INTIMATE CONTACT WITH THE GAP FACE.

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The front end is not greatly different from last month's receiver. Also, it means an increase in voltage across the phones. Although the results were satisfactory in the case of headphones, the 6AR7 is not really designed as a power output valve, but rather as a voltage amplifier. In this latter role its job is simply to increase the voltage of the incoming signal, because the grid of the following valve is only sensitive to changes in voltage and requires no real power to drive it.

On the other hand, the speaker does require power—a great deal more than the headphones—and the only way this can be provided is by means of a special valve designed to deliver power output. Such a valve is the 6V6, which is capable of delivering considerable power, about four watts, but which requires 12 volts or so of signal to drive it fully.

This month your set "grows up." You can put aside the headphones and let the whole family listen. Yes, we are fitting a loudspeaker and, in the process, delving into the mysteries of resistance coupling, cathode bias, and power output. There's no doubt about the results either. They're really good!

Reference to the circuit diagram will give you some idea of the changes involved. First there is a modification to the power supply, for the simple resistance type filter system we have used to date is not adequate for the amount of current we will need for the new valve. Instead, we have fitted a small choke having an inductance of 14 or 15 henries (the henry is the unit of inductance), but with only a few hundred ohms of DC resistance.

Better Filter

As we discussed in our discussion on power supplies (R & H June 1951), the choke provides better filtering under these circumstances than does the resistor. The choke is also capable of meeting the current requirements of a small. A resistor reduces the voltage available from the power supply (this was desirable for our smaller sets) but we now require the full voltage and current which the supply will give, amounting to about 350 volts at 50 mA.

The new valve is a 6V6-GT, which is one of the most popular of its type. The standard equipment in domestic receivers for several years. In many respects, the fitting of this new valve is similar to the fitting of a valve to our crystal set (Amplified Crystal Set, May 1951).

You will remember that we described the action of the valve in this set by explaining that the amplification characteristic caused a greater flow of signal current through the headphones than would have been the case without the valve. Now this is really an increase in power, since an increase in current flow means an increase in voltage across the phones, which is necessary to provide a voltage amplifier ahead of the power valve to raise the signal level to the required voltage. Also, the 6V6 has been working as a current amplifier detector and small power output stage, but now on it will function as a detector and voltage amplifier.

Unfortunately this is not possible when the preceding stage is a valve for, in addition to the signal voltages, there is also a steady DC voltage across it. If this were applied to the grid circuit of the 6V6, you may remember, that in our Amplified Crystal Set, we replaced the headphones with a load resistor which was also connected between the grid and cathode of the valve.

Figure 1 may help to explain how this is done. The resistor R1 in the plate load of the amplifier valve and, as the current increases, it is connected between the grid and cathode of the Val, Sine this is really an increase in power, an increase in current flow must also mean an increase in voltage across the phones. However, we can also increase the voltage across the phones.

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Output Valve

Where this voltage is not available from the actual detector circuit.
grid and cathode of the power valve, and connection between point A and the grid is made by means of the coupling condenser C.

The property of the condenser is such that it offers a low impedance path to the signals, but blocks off the DC voltage—which is just the effect we require.

The connection from the other end of the resistor, point B, to the cathode is more round about and, for this reason, it is often ignored. However, it is none the less necessary and worth working out. Point B is the HT supply point of the set and between here and chassis will be the last filter condenser of the power supply. In addition to its filtering action, it provides a low impedance path for any varying voltage so that, as far as these are concerned, point B is connected to the chassis. However, this is also bypassed by a large value condenser, so that there is a low impedance path all the way from point B to the cathode.

Finally we must provide some means of completing the grid-cathode circuit of the power valve in order that the necessary bias may be applied between grid and cathode. Furthermore, we must ensure that this potential is restored after each excursion of the applied signal voltage. In fig 1, R2 performs this function, and is known as the grid resistor.

RESISTANCE COUPLING

This arrangement is correctly defined as a resistance-capacity coupling, but it is more usually referred to simply as resistance coupling. It is an extremely popular system, since it combines good quality results with simple circuitry, few components and low cost.

The plate load resistor in this set is the 1 megohm volume control and the only other alteration to this portion of the circuit is the fitting of a screen resistor of 0.5 megohm to compensate for the increased HT voltage.

From the moving arm of the volume control connection is made to the grid of the 6V6 through a 0.05 mfd condenser and the grid resistor for the 6V6 is 0.5 megohm.

Despite the circuit's simplicity it can give extremely loud signals from local stations, and is quite easy to get going.

The only other part of the circuit which remains unexplained is the bias network in the cathode of the 6V6, and now is as good a time as any to come to grips with it. Firstly what are the requirements of a bias system? Well, simply that a certain voltage be effective between the cathode and grid, with the latter being negative.

The exact value will depend on the type of valve and the operating conditions.

The 6AR7-ST mounts behind the gong with a small metal shield around the grid case and condenser. The 6V6-GT beside the transformer, and the 6X5-GT immediately behind it.

The last GT mounts behind the gong with a small metal shield around the grid cap and condenser. The 6V6-GT's beside the transformer, and the 4X5-GT immediately behind it.

grid and cathode of the power valve, and connection between point A and the grid is made by means of the coupling condenser C.

The property of the condenser is such that it offers a low impedance path to the signals, but blocks off the DC voltage—which is just the effect we require.

The connection from the other end of the resistor, point B, to the cathode is more round about and, for this reason, it is often ignored. However, it is none the less necessary and worth working out. Point B is the HT supply point of the set and between here and chassis will be the last filter condenser of the power supply. In addition to its filtering action, it provides a low impedance path for any varying voltage so that, as far as these are concerned, point B is connected to the chassis. But the cathode of the power valve is also connected to the chassis, so that there is a low impedance path all the way from point B to the cathode.

Finally we must provide some means of completing the grid-cathode circuit of the power valve in order that the necessary bias may be applied between grid and cathode. Furthermore, we must ensure that this potential is restored after each excursion of the applied signal voltage. In fig 1, R2 performs this function, and is known as the grid resistor.

RESISTANCE COUPLING

This arrangement is correctly defined as resistance-capacity coupling, but it is more usually referred to simply as resistance coupling. It is an extremely popular system, since it combines good quality results with simple circuitry, few components and low cost.

The plate load resistor in this set is the 1 megohm volume control and the only other alteration to this portion of the circuit is the fitting of a screen resistor of 0.5 megohm to compensate for the increased HT voltage.

From the moving arm of the volume control connection is made to the grid of the 6V6 through a 0.05 mfd condenser and the grid resistor for the 6V6 is 0.5 megohm.

Despite the circuit's simplicity it can give extremely loud signals from local stations, and is quite easy to get going.

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Why waste time going from store to store when Price's Radio can fulfill your order from the best stock it has in Sydney.

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Solid elements with silverplated 240v. silver plated. These COAXIAL PLUGS & SOCKETS are ideal for low powered HF and all types of pick-up applications.

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PRICE'S RADIO

5-6 ANGEL PLACE, SYDNEY
This wiring diagram has been specially prepared to assist beginners in placing the parts under the chassis.

For a start, consider the 250 ohm resistor only. Being in the cathode circuit it will carry all the current flowing through the valve, and will have a voltage developed across it depending for its value on the value of the resistor and the current flow. If we knew the current flow (as we should), we can calculate a resistor value which will produce the required grid bias, which works out to 250 ohms in this case.

The polarity of this voltage is negative at the chassis end, which is just what we require, since the grid is connected to the chassis through the .5 megohm grid resistor. A point which puzzles a lot of beginners is how the full voltage across the bias resistor is still effective at the grid, since it is applied through the high value of the grid resistor.

The explanation to this is simply that there is no flow of current through the grid resistor, so there is no voltage developed across it, and the full value of bias is applied to the grid.

Well that explains the action of the resistor, but what of the condenser? Our discussion so far has assumed that the current flow through the valve is perfectly steady, but this will only be the case so long as there are no signals applied to the grid. As soon as signals are applied, the current will change and, in so doing, will change the bias voltage. Unfortunately it will change it in the opposite direction to the incoming signal, tending to neutralise the latter and considerably reduce the sensitivity.

Or at least this is what would (Continued on Page 51)
"Q PLUS" SETS THE PACE

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Modern valves need modern coils and "Q Plus" have a remarkable credit of firsts:

- First with Midget Resistor Type Coils
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Fans may now use miniature high-gain components throughout. Specially designed for communication, Kf Condensers, etc. for 1st stage. IF 13 for diode stage.

Retail Price, $1.00 each
RF power supplies are used less extensively in television receivers than either of the other types—60 cycle or flyback systems. They are sufficiently important, however, to warrant mention in the series, particularly as they may be employed freely in high quality oscillographs for television testing.

The basic principle of an RF power supply is quite simple. A conventional power valve such as the 6AV5 or 807 is set up in an ordinary tank circuit. Adjacent to the oscillator tank, a secondary winding is mounted having a large number of turns and arranged to be self-resonant at the frequency of oscillation. A very high peak RF voltage is generated across this secondary winding and this voltage is duly rectified and filtered for application to the picture tube circuit.

The advantage of an RF power supply is that it obviates the usual bulky and costly high voltage 60-cycle transformer. The advantage is not of great consequence at moderate voltages—up to about 200 V—but insulation and winding problems lend to multiply rather steeply beyond that. As a result, it may be simpler and cheaper in the long run to use an RF supply, even though it means providing a complete high frequency oscillator circuit.

Figure 1 shows a simple RF power supply of the type which might be employed in a small receiver or an oscillograph. It uses a 6V6-GT oscillator valve under normal class C oscillator conditions. The frequency of oscillation is determined primarily by the tuned plate circuit, involving 1.3 and two parallel condensers. The feedback winding is connected, in appropriate phase, to the grid. This forms the basic RF oscillator circuit.

L2 is the high voltage winding which must be wound with a large number of turns to give a suitable voltage. L2 is normally designed to be self-resonant within the timing range of the basic oscillator. This latter consideration is actually one of the factors which govern the selection of an operating frequency.

With some circuit arrangements, it is desirable to have the filament of the rectifier as the positive EHT point, which requires that it be supplied from a suitably insulated source. Rather than provide this winding on a 60-cycle transformer, it is often easier to add a small winding to the HF transformer and draw the filament power from the oscillator.

Naturally, it is necessary to select a rectifier having a suitable heater rating and this factor is taken into account in the design of rectifiers for this class of service.

Figure 2 suggests the construction of a typical RF transformer as used in the circuit of figure 1. The coils are wound on a thin-walled tube, of impregnated bakelite, or some other material exhibiting low power factor and leakage. The grid and plate windings occupy the same respective positions as in the circuit diagram.
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H.T. SUPPLY FOR YOUR CAR SET, AMPLIFIER, &C.
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between 25 and 45 percent, although supply of this nature is quoted at.

portion of the total peak voltage of the transformer and also allow for loss reduction through the grid of the high-voltage section. Slots in the transformer ensure fairly low distributed capacitance and reduce the chance of oscillation and must be adjusted to set up a similar rectifier with a high voltage secondary, which is normally wound in several sections.

The usual procedure is therefore to terminate mains oscillation and one scheme, which has been used, is to terminate the "Q" of the high voltage section normally from a high-powered and intermittent source. The position of the filaments by visual inspection.

If the temperature of the filament is too high, only a very light spring which simply passes around the envelope of the tube. This is derived from a known battery or a 50-cycle filament frequency source. The reverse procedure is necessary to slide the heater pick-off the oscillation immediately after off the rectifier filament voltage can no longer be measured by ordinary means in the event of the rectifier being replaced.

In many cases where the picture tube delivers more input to the rectifier. Since the screen is blacked out, the highest point of the voltage is of course lost. The reverse procedure is not involved, being only during the flyback interval. Focus may also be affected.

The most disconcerting effect occurs when a harmonic happens to project a shadow which moves along the line scan, bars of light and intensity at a rate comparable with the line frequency. The difficulty of achieving complete isolation is not involved, but can be achieved with a system of voltage regulation which tends to maintain the gun voltage at a fairly constant figure. Chief advantage of voltage regulation is that it allows the average picture brilliance to vary rather well to a system of voltage regulation which tends to maintain the average picture brilliance to vary with the subject matter, according to the subject matter, which was arranged that it controls the screen bias, thus allowing the valve to oscillate during the brief flyback interval.

In between the two is placed the feedback capacitor. FEEDBACK CAPACITOR SUPPLY LEADS.

It is normal, therefore, to enclose the horizontal sweep circuit and the circuitry is so arranged that it controls the screen bias. Negative pulses from the RF supply and the circuitry is so arranged that it controls the screen bias. Focus may also be affected.

The system of voltage regulation is that it allows the possibility of visual RF interference. The ground and he can devote his entire energy to making a crash, realises that his plane is in danger, and where the bleed on the EHT base. The reverse procedure is not involved, being only during the flyback interval. Focus may also be affected.

Although the fundamental frequency may be in the vicinity of 200 Kc, the harmonics must be adjusted to set up a similar rectifier with a high voltage secondary, which is normally wound in several sections.

There are many possible variances of the pulsed RF idea and it is hardly necessary at this stage to describe next month.
PAINT

BLANKET OFFER

PERIODIC PRISMS

Binoculars

COMPASS

COMPASS MENTIONS

TRAVELLING RUGS

HEADPHONES

COFFEE WEST

COMPUTERS

VW

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COMPUTERS

HEADPHONES

TELEPHONE

COMPASS

COFFEE WEST

AMERICAN DIRECTIONAL

Gyro Indicators

AMERICAN DIRECTIONAL

Gyro Indicators
There is an article which will suit those who like their theory mixed with a few formulas and vectors. Prepared by the Engineering Dept. of the Aerovo Corporation, it analyses the operation and characteristics of parallel and series-tuned circuits.

The property of parallel resonance, as in the circuit of Figure 1, is basic to the operation of the tuned circuit, and an understanding of the principles is essential to a full comprehension of tuned circuit operation and design.

An alternating current views the parallel resonant circuit of Figure 1 as an inductive reactance in shunt with a capacitive reactance. In flowing through the combination, the current will encounter separate impeding effects in the two legs, the two reactances acting upon it by different amounts, depending upon the frequency of the current alternations and the individual values of the coil and condenser.

At one critical frequency, for any given values of inductance and capacitance, the inductive reactance and capacitive reactance will be different. The basic parallel tuned "line" is usually an earth upper end connecting to point A, and a portion (Ic, the condenser current) flowing through the capacitive leg of the circuit, will actuate M3. The other component (II, the coil current) flowing through the inductive leg, will actuate M2. The readings of M2 and M3 will normally be unequal, and that of M1 may be less than either of the former.

If the capacitance of the condenser C is then varied throughout its range, Ic and II will gradually tend to become equal, while, at the same time the line current (I) will be growing steadily smaller.

Assuming that the capacitance range of C is appropriate, there will which C and L will have the proper relation to render the circuit resonant at the frequency of the applied voltage. I will fall to a very low value, approaching zero, at resonance, while the large magnitude and near equality of le and Il at that point indicate that the reactive properties of the circuit have very nearly disappeared.

Because of the high current in the circuit the voltage developed across LC will be at its peak. Beyond resonance, le and Il will again become unequal as the capacitance of the condenser is varied further.

Thus it may be seen that the proper adjustment of L and C to resonance for any frequency will result in the appearance of a maximum voltage (the resonant voltage) across the combination and minimum current (line current) in the external circuit. When the circuit is connected to a voltage-operated device, such as to the grid-cathode input of a vacuum tube, the voltage may be selected and applied to the device by resonating the circuit. This is the basic function of the receiver tuned circuit.

The resonant frequency (f) may be determined from the equation:

\[ f = \frac{1}{2\pi \sqrt{LC}} \]

where L and C are the inductance and capacitance of the circuit, respectively.

The above equations hold for both series and parallel circuits. In the case of pure capacitance in parallel with pure inductance the simple vector relations of Figure 2B would apply. Here Ic is leading the applied voltage, E by 90 degrees. "I" (the line current) leads E by 90 degrees when Ic is greater than Il and legs to degrees when Il is greater than Ic.
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When $I_c$ equals $i_u$ (parallel resonance), $1$ is zero. The inductive reactance is equal to the capacitive reactance equals $1/\omega C$.

In actual practice, all coils possess some RF resistance, which appears as a resistance in series with $L$ (see Figure 3) and gives distinctly different expressions for $I_c$ and $i_u$.

Condenser loss, which would appear as a resistance associated with $C$, has not been considered here because $1$ is normally quite small.

With respect to phase, the line (the vector sum of $I_c$ and $i_u$) is always $90^\circ$ from each other. Possible consequent losses are to be avoided in receiver tuned circuits and full advantage is to be taken of the variable condenser range.

Hence, increased turn spacing or lattice winding is resorted to in efficient circuits to reduce distributed coil capacitance.

From equation (1), it is seen that in any variable condenser-fixed coil parallel resonance circuit, the maximum and minimum frequencies at which the circuit may be resonated will be determined by the maximum and minimum capacitances in shunt with the coil.

Neglecting distributed and stray properties for the moment, these limiting capacitances may be taken as those of the tuning condenser. The wider the capacitance range of the latter, the wider will be the frequency band over which the circuit may be resonated.

Often in practice, the maximum resonant frequency of a tuned circuit is chosen as some multiple of the minimum frequency. A ratio of 2:1 is quite common in some applications, although a higher ratio (about 3:1) is encountered in broadcast tuners.

In the case of amateur band-spreading, the band of frequencies covered by the tuned circuits is only a few kilocycles wide, representing a ratio of little more than unity.

If it is desired to multiply or divide the resonant frequency of any parallel resonant circuit by any factor, and if the fixed inductance value, original frequency, and original capacitance are known, the capacitance of the condenser at the new frequency will be equal to the capacitance at the original frequency. Thus to double the resonant frequency (or to provide a tuning range of 2 to 1) the capacitance must be quartered — the tuning condenser must have a capacitance range of 4:1. Or to halve $f$, $C$ must be quadrupled.

Within practical limits, any desired frequency range may be achieved by employing a condenser which gives the proper amount of capacitance variation in conjunction with the inductance capable of resonating at the band-limit frequency. It is obvious from the foregoing that the range of capacitance variation in the condenser will decide the frequency range of the tuned circuit, and that any extension of the capacitance limits above and/or below normal will correspondingly widen or narrow the band of response.

In order to bring about such changes in the limiting values of $C$, mechanical alterations might be possible in the tuning condenser by the addition or removal of plates. The same results may be accomplished electrically by interposing auxiliary condensers in series or parallel with the tuning condenser.

From (1), a variable condenser having a maximum and minimum capacitance range, would be useful in obtaining the desired range of tuning.
The 1951 Majestic was constructed on a completely new chassis, for which blueprints will be available. Aerial, earth, and pickup terminals are inset on the rear.

The controls from left to right are: Gramophone switch, volume, treble cut and bass boost.

Most out of sets have their origin in a matter-of-fact survey of seasonal requirements and the kind of designs which have or have not recently been covered. After checking with the trade about supplies, we worked out a circuit and layout and, within a few days, the new set is born.

The "1951 Majestic" had an entirely different beginning, when a very good friend of the editor suggested that it was about time we designed the kind of set that he personally wanted to build. It was said with just the right amount of emphasis to make us bite back.

"Okay then, what kind of set?"

"Well, a fairly big one that will sound good — radio and pickup."

"What kind of pickup?"

"Oh, it must be a lightweight ... one that I can use on microgroove discs."

"Yes, but magnetic or crystal? That affects the whole design of the circuit."

"I don't know, frankly. I may want to use either. Can't you put in a switch or something? I don't want a set that only works with one kind of pickup! I might want to use either one later on."

"Well, yes, it could be done but it would mean an extra valve."

"Who's worrying about that? I'm just telling you what I want!"

"All right, then, do you want 807s in the output?"

"Heck, no! They're too big and expensive. Why not a couple of 6V6s? They'll make plenty of noise for me."

"TRF or superhet?"

"TRF definitely. I'm not interested in short-wave and distant stations. I just want the locals as well as you can give 'em to me."

"You'll run into trouble with 'em unless you put in a whistle filter."

"Okay then ... put in a whistle filter."

"In other words you've forgotten all about the Junior Recorder in the April issue, which had most of the features you're talking about."

"On the contrary, it was the April issue that set me thinking... only I'm not interested in recording just now and I do want a bit more power output! What's more, it must go inside a cabinet and have a nice big dial..."

So the conversation went on, till we had a pretty clear picture of what this friend wanted. Tone control facilities, yes. But in moderation. Too many complicated knobs only confuse the rest of the family.

By the time our friend had finished his sales talk we had the feeling that plenty of other people would be interested in the kind of set he was talking about.

After that, it was merely child's play. Just a few dozen holes and cut-outs in a prototype chassis, a book full of data, a box full of bits and a solid fortnight of Ray Howe's time. Add to this our draughtsman...
and photographer, a concerted effort on the typewriter and the new set becomes yours ... as the "Majestic."

Getting down to the circuit design, the tuner presents no special difficulty being a standard twin-tube arrangement with two RF stages and a diode detector.

The first valve is a 6SK7-G1, which has medium gain characteristics by modern standards. A high-gain miniature type could have been used, but space is not at a premium in this set and the additional gain is of little practical consequence.

SECOND VALVE

A diode-pentode is required for the second stage and our choice for this was another "GT" valve, namely the 6AR7-GT. The signal is passed from its plate circuit into the diodes, where it is rectified and the AVC voltage is generated.

Rude remarks are occasionally made about diodes and AVC circuits but the amount of distortion introduced by a well-designed system is of a very minor nature. It is more than outweighed by simplicity and convenience.

The two RF tubes have a common screen supply, which is arranged to be broken when the amplifier is switched for record reproduction. A standing bias of approximately 2.5 volts is supplied to the grids from a back-bias source, which, thus, allows both cathodes to be earthed directly.

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The full gain and selectivity of the tuner will not normally be required and, in fact, the selectivity will need to be reduced deliberately to avoid interference. Many constructors seem to imagine that a TRP circuit is a sure guarantee of fidelity but such is by any means the case. A partially regenerative TRF tuner can easily give a far less favourable selectivity curve than a well-designed superhet.

In this case, we suggest loading the grid winding of the second RF coil with a resistor which can well have a value of about 25,000 ohms. The idea is to reduce the value of the resistor progressively until the tuner has only just enough gain and selectivity to receive and separate the local stations.

CIRCUIT LOADING

If you find that the loading resistor has to be ridiculously small before the condition described above is achieved, a resistor may also be added across the grid circuit and lastly, across the diode circuit. By following this technique the pass band of the set will be widened appreciably and the high frequency sidebands admitted with the least possible attenuation.

The process, of course, leads to the immediate elimination of the heterodyne beat notes, so no further mention will be made of the whistle filter stage and the preamplifier stage for use with a low output magnetic pickup.

Here is the complete circuit diagram for the Majestic. Notable features are the whistle filter stage and the preamplifier stage for use with a low output magnetic pickup.
Choose your equipment from this famous range!

'Especially designed for the production of speech frequencies. With rising response at 1000 c/s, this microphone offers exceptional sensitivity.

Price: £1/18/6.

MIC. U MICROPHONE INSERT provides high qualities with minimum leakage. Exceptional slimness is recommended.

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MIC. 14 STANDARD SPEECH MICROPHONE INSERT with nickel-plated brass base. Mechanical strength and rigidity.

Price: £1/19/6.

G.P.20 MICROCELL PICK-UP is the most outstanding pickup on the market! Incorporates the latest advances in pickup design and sets a new high standard in sound reproduction. The G.P.20 MIC has practically no existence. Fitted with permanent sapphire stylus and automatic base-boost which permits filling to any domestic radio without additional equalisers. Plays Mono-groove or ordinary recordings. Available at all Radio Stores. Price: £5/11/8.


CARTRIDGE ONLY (G.P.10) : Price: £1/19/6.

ACOS CRYSTAL PICK-UPS

A COS W/FLEXIBLE


CARTRIDGE ONLY (G.P.12) : Price: £1/19/6.

AMPLION (ASIA) PTY. LTD., SYDNEY

SOLE VICTORIAN FACTORY REPRESENTATIVES

DISTRIBUTORS CORPORATION Pty. Ltd.

FORMERLY J. A. POGOHOFF Pty. Ltd.

403 BOURKE STREET, MELBOURNE. PHONES: MU3908, 3058.
allows the use of a more conveniences the tone, the whistle will sound. An iron slug through the coil allows it to be tuned exactly to resonance, while the 6.8 meg. potentiometer is adjusted the maximum attenuation.

The specifications for the whistle filter are given in the "Junior Recorder" and we shall simply reproduce the main diagram. The only difference is a physical adjustment for the mounting of the filter coil to bring the slug adjustment out alongside the broadcast aerial.

A three-position lag strip was also added to the cover of the potentiometer to provide a convenient several of the internal connections.

For practical purposes there is little point in setting the slug adjustment for a little extra time and ingenuity but it is well worth while in terms of the final result.

Viewing the audio requirements, the amplifier may be required to operate from the detector output, from a crystal grid or from a lightweight magnetic.

There is no special problem and it is merely a matter of adjusting the volume control circuit from one signal source to the other. The special nature of a crystal project endows fairly high output and also necessitates use quite small for the usual bass attenuation in standard recorders.

This is true of all ordinary crystal project and many other varieties as the 1250 ohms. While the 6250 ohms, 3.5 watt wirewound, 150 ohm 5 watt filter choke. This latter coil has interchangeable heads for the normal bass attenuation in standard recorders.

The same remarks apply to nearly all lightweight magnets, including the microphone types and what one might term the "semi-lightweights" now fitted to record changers.

**PARTS LIST**

- chassis 14½ x 18½ x 6½ in.
## STANDARD POWER & VIBRATOR TRANSFORMERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Vlb.</th>
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<th>6.3 V</th>
<th>2A</th>
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<tbody>
<tr>
<td>PF 122</td>
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<td>PF 146</td>
<td>200</td>
<td>30</td>
<td>40</td>
<td>12</td>
<td>325</td>
<td>150</td>
</tr>
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### FILTER CHOKES

- **RECEIVER POWER TRANSFORMERS**
  - PF 106: >40 325 45 6.3V 2A 5V 2A
  - PF 196: 240 265 5 6.3V 2A 5V 2A
  - PF 151: 200 31 40 283 60 16.3V 2A 5V 2A

### OUTPUT TRANSFORMER TO VOICE COIL

- **CODE FULL FREQUENCY RANGE (30-15,000)**
  - OP24: 5000 8.4 2.1 with reed 1 1

**OUTPUT TRANSFORMER TO LINE—P.A. RANGE**

- **OUTPUT TRANSFORMER TO LINE—**
  - **NON-CHIRP**
    - 12.5 8 2.3
  - **CHIRP**
    - 15 12.5 8 4 6 5 4 1 2.7 2.3 2 11.3 8 2.3 15 12.5 8 4.6 5 10

### MODULATION TRANSFORMERS

- **OUTPUT TRANSFORMER TO LINE—P.A. RANGE**
  - 32 6 12 10 12

### SPECIAL CHOKES

- **CF112**
  - 1 10 1 70 1 250

- **CF1**
  - 1 1 1 0

- **CF5**
  - 6 1 2 3 4 5 6 7 8

### VIBRATOR TRANSFORMERS

- **VT1**
  - 24 250 60 0.005
  - 12 250 60 0.005

- **VT19**
  - 32 250 60 0.005

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MUM will come in FIFTY-FIFTY on that portable radio - if you let her use it too!

Keep your portable packed with seven days of extra needed for more fun on this rainy, foggy weather. The eveready

EVEREADY MINI-MAX
PORTABLE RADIO BATTERIES
MA emas me them. ’

ingi ad is virtually vibafil

Ail Coinoisur products a

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2 ^ models are available: standard (illustrated) (or IC'-I?

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tia dead true, the flywheel action eliminating all "Wow,"

Connoisseur AMPLIF

J. H. MAG RATH & Co.

208 LT. LONSDflLE ST., mHBOUS A^CENlW

SEEJEUino

ELECTRICAL

testing instruments!

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HEAD OFFICE & FACTORY; HERBERT STREET, ST. LEONARDS., N.S.W.

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FASE FIFTY-FOUR

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UNDERCHASSIS OF THE MAJESTIC

The NEW Ferry motor*, with their instant starting and fast pick-up are always "ready for the down beat." The abundance of velvet-smooth power and precision manufacture ensure complete satisfaction.

Unique features include:
- Heavy duty machined eatn aluminium turntable.
- Deep wall bearing.
- 60-watt motor.
- Sell-starting motor.
- Silver steel shaft.
- Speed change without removing turntable.
- Motor floated on rubber and mounted on cast aluminium plate.
- Weight of turntable — 5 lb.

12" £19/17/6. 16" £32 (Both prices plus freight)

*Radio Distributors Pty. Ltd.
Radio-Electric Wholesalers
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RADIO AND HOBBIES FOR AUGUST, 1931

GERELENTY FOUR
FIRST IN AUSTRALIA TO OFFER Complete Long Playing MICROGROOVE EQUIPMENT

THE MOTORS

BIRMINGHAM SOUND REPRODUCERS
Birmingham Sound Reproducers world famous
motors are now distributed in Australia by Goldring.

2-Speed (78 and 33 1/3 R.P.M.)
Motor Unit M.U.10
The inexpensive and most reliable motor unit for both standard and long-playing records (33 1/3 r.p.m.). Supplied with heavy steel turntable.

RETAIL

3-Speed (78, 45 and 33 1/3 R.P.M.)
Motor Unit M.U.14
A de-luxe three-speed turntable unit for use with high-grade instruments. The ingenious and simple method of speed change is achieved by a movement of the speed change knob. Smoothness of action is assured by employing the B.S.R. de-luxe 4 pole motor which is noted for its low rumble and vibration factor.

RETAIL

Complete Record Player "Plug-in" Unit
Limited quantities are available of the Goldring combined standard and long-playing record player "plug-in" unit for your radio or "tingle" radiogram. Features the Goldring J-wire pickup and B.S.R. M.U.0 or M.U.14 motors. Complete in high quality leatherette case.

Sole Australian Agents for B.S.R. motors:
GOLDRING ENGINEERING
37 H.E. Ave., St. Marys, N.S.W.
South Australian Agents:
Farley and Fahy, 77-79 Wright St., Adelaide
from the speaker. To overcome this,

cabinet) which is very undesirable

chassis, there will be a space be-

new look doesn't it!)

the rear, lirst pinning it into simple

particularly difficult. After cutting it

wood-working tools, and not par-

well within the scope of ordinary

and skill dictates. The uattcrn shown

simple or elaborate as your taste

sound through, and this may be as

making the whole thing as one unit.

is wot as neat an arraueinent as

piece of half-inch Caheite Is just

between the speaker and panel. A

be thick enough to fill the space

it will be necessary to make a small

is nol p.vail- or alternatively the coupling to the

s square and should have no difficulty in receiv-

s to be obtained times and the volume adjusted

mt panel (or As it is, the regeneration ean be set

junted on the duced by decreasing the regoner-

speaker silk lo the controls should be much the

ils may be as ation required. Incidentally it's

juite effeclive. gram alone—try it!

uattcrn shown your wiring from the circuit dia-

as your taste about time you were able lo do sill

ils may be as ation required. Incidentally it's

el to let the gram should provide all the infonn-

s cabinet, and for general listening,

uean an extra left until you have the set working,

pes the holes the valve. One side was bent at

i holes in the and a half long was bent into a

rling will de- until the valve was shielded.

I it may be a conveuient if used as a bedside set.

neni nins to- ut a small shield around the GAR7.

i ads. so that the better the baffling the

ected position the efficiency. This effect is most

i the chassis, the speaker which otherwise reduces

i the position inomeni:. Briefly, however, it is

of the con- may be litted hack into place.

10 circuit. Let upper holes, after which the panel

rrent change, lower corners of the speaker. The

that it will quired to pass the panel mounting
It's just as well Tom seeks our advice, for he could land in a great deal of trouble, given the wrong information. Just think of the complications which could arise had he been allowed to go through life without an answer to the first question.

**What is the difference between an oscillator and an oscillator?**

This is a most important question, and the one that will be most difficult to stop once they are going properly. Most of all, Tom's curious simple means to be applied. Excellent examples of means and methods are Synergy's frame—which, on request, will bring the subject up again.

In a radio set a valve may be induced into a state of oscillation by feeding some of the energy from the output circuit back to the input circuit. In certain cases we require valves to oscillate for special purposes.

What is a Heaviside layer?

A Heaviside layer is that bit of the earth's atmosphere between the earth and the reflecting layer. It is usually a region where the density of the air is such that radio waves are reflected back to earth. The condition of the Heaviside layer is very important for radio communication.

The idea is that radio waves leave the transmitting aerial at an angle and go out from the earth's surface until they strike the reflecting layer, when they are again returned to earth, perhaps many thousands of miles distant from their starting place. In AM radio communication the receiving valve may not be able to detect this.

If you care to check through the magazines for high frequency communication, in any of its standard textbooks you will find plenty of information on this very interesting subject.

The circuit of the "Senior Porta-Shell" shows an AVC connection to the tuning gang, you would be wise if you could explain this to Tom, and tell me how to connect it.

HELP FOR "TOM"

Mr. G. Hough, of 1 Burring Av., War-19, NSW, has written to say that his two electro-dynamic speakers are capable of handling the output of his amplifier, provided that a variable condenser is included in the circuit. The AVC line is derived from the lug of the coil to earth.

The tuning condenser is always adjusted in such a way that it will resonate in any case, with the movable plates at a suitable angle, while fixed condensers are represented by two heavy parallel plates. Tuner and meter condensers are drawn in the same way, if they are used, and fixed condenser plates are of the same value as the variable condensers, but are usually marked with the value across them, are used to indicate practically variable capacities.

You can go wrong if you remember that a "variable condenser" is indicated by the arrow. Much the same applies in the case of coils and IF transformers.
in the quality.

connected.

the extension speaker in parallel with

you simply connect the voice coil of

live limes. It is underslood, of course,

be varied over wide limits. Wilhou:

instance, in our own laboratory we

eral ....

on loudspeaker mulching in gen-

even buying the ex Ira Hanslonner.

great when tbe second speaker is

provision for an exlcnsion speaker

that you won't notice the difference

sented to the output value will be

the maximum output of which the

speech or music, which is lar below

ordinary room volume on cither

lhat the cutpui valve is delivering

is raised or lowered by a factor of

difficult to detect any difference in

impedance reflected to the valve may

a switched primary circuit so thai the

have many limes connected a re-

many people seem lo imagine. For

Tom, but before lhat, some remarks

speaker work cjuile well wilhiiut

ot lite UF and oscillator coils are

In which case it is quite an easy

production or (lamafje tbe valve.

ohms. Would the 1 ohm difference

will match the output valve to at

can obtain a transformer which

coil impedances of 2 ohms and I

speaker. Both speakers have voice

which is equipped with a Sin

end of the coil

critical, but yc

close to it. The

avoid unnecessary complication.

in tbc case of the IF transformers, to

gether with the fixed shunt capacitors

provided with iron dust slugs, so that

the windings ol' both IF trans-

duciaiu-e is variable or iliat the mu-

used lo icdkare thai Llie value ol' in-

leriial aerial and earth con be con-

provide a wim


DUREX'

SEALING TAPE

SUNNIESTER

PHOTO PHORO

VHICLES
Thus the plate current of the 6V6
mitter receiver was to make a job
connected to the speaker voice coil.
ing of the speaker transformer con-
connected, and the voice-coil wind-
to this section, the oscillator is dis-
half of the 6SL7. When receiving, the
stor, choke-coupled to the second
quenched super-regenerative detec-
separation.
less balance out and avoid core
and that of the oscillator more or
which is connected to the oscillator.
transformer, the second half of
centre-tapped push-pull sneaker
able a standard crystal microphone
triode producing enough lift to en-
one half a GSL7 a high gain dual
modulated by a GV6GT driven from
or that described last month. It is
procedures will take in most of the points
about receivers; illustrated by a trans-receiver
have used in our own experiments.

We are satisfied the same approach, plus a
few ideas we have accumulated
ourselves.

To note in a standard approach, plus
describe the equipment, which pro-
procedure will take in most of the points

The receiver uses a 955 as a self-
 modulation oscillator circuit similar
to that described last month. It is
assembled in a QVQT frame from
are half a grid — a high gain dual
not quadrature. A carbon microphone
if the maximum frequency. It is
made of 1/8 inch silvered
ported by a small polystyrene block.
The same switch is used to con-
nect the aerial to the oscillator, and to the
receiver circuit, although it is
proposition of the 6V6 bias resistor, which
Mike current being taken from part
of the plate condenser made of two discs
have identical. One is used as
to the other end of the plate condenser, and some won't super-regen-
needed to get best results from the
valve, and some don’t.

A crystal microphone can be em-
powered directly into the 6V6
grid circuit through a transformer,
close percent being taken from point
is split into two sections—200 and
the grid circuit, and back, which is why the switch was
removed to the 6V6 grid circuit, and
the the loudness used.
A carbon microphone can be em-
powered directly into the 6V6
grid circuit through a transformer,
close percent being taken from point
is split into two sections—200 and
the the loudness used.
A crystal microphone can be em-
powered directly into the 6V6
grid circuit through a transformer,
close percent being taken from point
is split into two sections—200 and
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powered directly into the 6V6
grid circuit through a transformer,
close percent being taken from point
is split into two sections—200 and
the the loudness used.

The cathode lines are mounted
return-
some valves work best with an earth
leach grid leak to high tension generally
across the cold end. Returning the
grid leak to high tension generally
super-regeneration, although
some valves work best with an earth
core.

Some experiment is nearly always
needed to get best results from the
valve, and some won’t super-regen-
are 5°C and winders up to 5
mms may be taken; there is no need
and fast coil. All our valves worked
best with the above shown.
Up to 198 volts or so may be
needed for super-regeneration, par-

EXPERIMENT NEEDED

Some experiment is nearly always
needed to get best results from the
valve, and some won’t super-regen-
are 5°C and winders up to 5
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and fast coil. All our valves worked
best with the above shown.
Up to 198 volts or so may be
needed for super-regeneration, par-

by John Moyle

The front view shows the aerial in-
ite condenser, and the whole
makes quite a neat little job.

The mike input is shielded right
up to the small plate. Switching in
this circuit produced hopeless feed-
back; but by the switch was
removed to the 6V6 grid circuit, and
the twotriode used.

The 955 seems to work quite well
in this circuit; although it is
close to a maximum frequency.

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in this circuit; although it is
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close to a maximum frequency.
The circuit diagram shown is equally suited to 144 Mc as to 576 Mc, using tuning coils instead of lechers. Power supply is normally 200-250 volts. Ch 1 and 3 have 6 turns 3/16 in diameter, and Ch 2, 3 turns 1/8 in diameter.

A rough frequency adjustment can be made after the lechers are cut approximately to length by bending the tiny tubular grid cap to and from the lechers. The disc is soldered or otherwise fastened to the end of a 1 inch fine threaded bolt which screws through a block of insulating material such as hard rubber. A slot is cut through the bolt hole, and nut screws down the block so that another 1/8 inch bolt running through at right angles can be used to cramp the control shaft more or less tightly to take up wear. We have found this a very simple and emns method of mounting. The hard rubber block is of course bolted to the front panel so that the disc can be adjusted from the front of the set.

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SHAFT MOUNTING

To facilitate tuning, the lechers are mounted vertically, and are centered directly to the pins of a small acorn socket which, in turn, is held to the panel bracket by a small angle bracket of its own. Whut is done is to围绕 a small metal disc about 1 inch diameter and from the lechers. The disc is nodulated or otherwise formed at one end of a 1 inch fine threaded bolt, which is driven through a block of insulating material such as hard rubber. A slot is cut through the bolt hole, end part way down the block so that another 1/8 inch bolt running through at right angles can be used to cramp the control shaft more or less tightly to take up wear. We have found this a very simple and emns method of mounting. The hard rubber block is of course bolted to the front panel so that the disc can be adjusted from the front of the set.

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- Perfect fidelity—no "record noise"
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- Build up your library of half-hour recordings.

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**The Sound mirror reproduces with better than studio fidelity the human voice, speaking or singing; or music (from a child at the piano to a full orchestra) yet it's simple as ABC to use.**

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**£43/10/-**

**TeleTape Portable Recorder**

For an easy portable, high-fidelity, easy-to-use tape recorder, the TeleTape remains Australia's outstanding value! This handsome case is simple to carry to the homes of your friends, to your office, or anywhere you would like to record or play back your recordings. The TeleTape records a full half-hour at a time, with amazing faithfulness and no background noises of any kind. You can record speech, singing and music, equally clearly from life, radio or the gramophone. You can play back immediately, or any number of times. You can erase a recording and use the tape again. Price £139/10/-.
selecting a very small, split-stator type.

Aerial coupling is something of a headache at this frequency. The method used must be equally suitable for transmitting and receiving, and, if possible, for a change-over switch.

We used 300 ohm line for several reasons. Firstly, by using a double-wafer switch, and straddling the 300 ohm input across a section on each wafer, a roughly correct spacing can be maintained to switch through from transmitter to receiver. We reduced the spacing between wafer by cutting away some small section to give enough line-spacing to give about 300 ohms.

Coupling to the receiver via the cathode choke made a little larger than normal — 2 turns 1 inch diameter. A single turn aerial coupling loop was close-coupled to this coil and fed from the change-over switch.

OTHER METHODS

Many amateurs use a length of tubing in the cathode circuit carrying one of the filament leads something like one-half the transmitter cathode circuit, and set the aerial connection just above this tubing. This method is fine if you plan to use a single extreme cut to our own out calls for an unbalanced connection. Our method avoids the use of trombone connections, etc., and also allows an aerial switching which would be unsuitable for the trombone circuit. There is no easy way of switching co-axial tubing.

(Continued on Page 79)
FIRST IN AUSTRALIA TO OFFER
Complete Long Playing MICROGROOVE EQUIPMENT

THE PICKUPS

Goldring Pickups (High-fidelity) have been proved in the markets of the world... now bring microgroove pleasure to Australian music-lovers.

TWO FAMOUS MODELS THAT HAVE SET THE STANDARD OF PICKUP DESIGN

1. "Headmaster" Pickup
   Hyper-fidelity, with interchangeable heads. ‘Headmaster" and "Headmaster" with microgroove heads are available. A typical system of the beautiful design is shown.
   The microgroove head—thus completing the versatility of this superb reproducer.

2. Three-way Pickup
   Goldring's "Headmaster" provides a very neat solution to the problem of changing from Standard to L.P. records. In this design, the stylus becomes the armature. Changing from Standard to L.P. is achieved by changing the stylus and by weight, adjustment on the arm. Retail price... £7/10/-

TYPE OF RECORD

<table>
<thead>
<tr>
<th>STYLUS TIP SIZE</th>
<th>COLOUR</th>
<th>CODE</th>
<th>RETAIL PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>.0020&quot;</td>
<td>Red</td>
<td>R*d</td>
<td>£4.75</td>
</tr>
<tr>
<td>.0025&quot;</td>
<td>Green</td>
<td>Gr »«</td>
<td>35/-</td>
</tr>
<tr>
<td>.0035&quot;</td>
<td>Orange</td>
<td>07an^7</td>
<td>35/-</td>
</tr>
<tr>
<td>.0040&quot;</td>
<td>Yellow</td>
<td>Yellow</td>
<td>47/6</td>
</tr>
</tbody>
</table>

ARMS—12"

If unable to obtain from your retailer or wholesaler, contact Goldring Engineering (Australasia) Pty. Ltd., 57 H.C. Areo, St., Marys, H.S.W.

All technical correspondence may be addressed to South Australian Agents: Farley and Fahy, 77-79 Wright St., Adelaide.

GOLDRING ENGINEERING

SPECIFICATION

<table>
<thead>
<tr>
<th>OUTPUL</th>
<th>3.16 CMS/SEC. RMS VELOCITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQUENCY</td>
<td>STYLUS PRESSURE 78 R.P.M.</td>
</tr>
<tr>
<td>COIL IMPEDANCE (AT 1000 CPS)</td>
<td>COLL RESISTANCE</td>
</tr>
<tr>
<td>OPTIMUM LOAD</td>
<td></td>
</tr>
</tbody>
</table>

PAGE SIXTY-FOUR
I've had a flood of inquiries lately about the type of test gear needed to start a radio service business. It's far too large a subject to be handled in one article, so I have decided to spread it over the next few months, at the same time detailing the more interesting service problems as usual.

Most of the inquirers have a phase of the radio industry perhaps lacking a course in servicing, both as a hobby and against the time when they can open their own service shop. Since the financial outlay usually has to be considered carefully, the "new chum" is often a little confused as to what will represent the best investment of his limited capital. If he can only buy one instrument at a time, what is the best to buy first, and in what order should he consider additional items?

If you can only run a full-time business on this basis you'd probably go broke. However, spare-time work is not so critical and the additional time can fairly be charged to experience. 'Now what kind of multimeter should you buy? The first point which is often raised is whether it should be AC/DC or DC only. There does not seem much doubt that the slight extra cost of the AC ranges is well worth while, as plenty of faults occur on the AC side of the circuit. Even in country areas the prevalence of vibrator sets calls for this feature. In addition to these more obvious uses, it must be remembered that the multimeter is the basis of the output meter and, while you may not need this immediately, you certainly will when you add an oscillator to that it is impossible to lay down hard and fast rules. The best I can do is present the facts as I see them in the light of experience and hope that they will help you to make your own judgment.

Should he build or buy his equipment, and what represents the best compromise between cost and performance in any particular item? These and a dozen other questions crop up every time the purchase of a piece of equipment is contemplated and there is so much to consider. It is impossible to lay down hard and fast rules. The best I can do is present the facts as I see them in the light of experience and hope that they will help you to make your own judgment.

How many ranges should it have? If an instrument is not to become unduly complex (and costly) it is desirable to restrict the main selector to one switch, and this in turn means no more than twelve ranges, as this is the maximum number of positions on a commercial switch. The three characteristics to be read are voltage, current, and resistance. Important multimeter

While there have been countless arguments denying that the best buy is the good, for it will teach you to make the best possible use of it. Admittedly this may slow you down a little and, in fact, if you try to do too much at once, it can be very frustrating. However, the best buy is the one you can afford to use.

Another point to be considered is the relative merits of the multimeter as just discussed and those of the combined valve tester and multimeter. These latter instruments are extremely versatile, providing the normal multimeter ranges with perhaps some additions in the resistance section, plus valve testing facilities and such additional features as condenser leakage tests, capacity tests, and electrolytic checks. There is no doubt that one of these instruments is an ideal piece of equipment for a serviceman but there is some doubt as to whether it is the best for your first purchase. In the first place, there is the outlay to be considered. There won't be much change out of £40 for one of these. The purchase of any other instrument for it is often thought that if a multimeter is purchased first, and a combined unit later the former will lie rendered obsolete or unnecessary, but this is seldom so. By the time the combined instrument has been properly evaluated, the serviceman will have decided whether he needs it.

The voltage and current ranges are fairly well standardised at 10, 50, 100, 250, and 1000 volts AC and DC, and 1, 10, 50, and 250 mA DC. There does not appear to be much point in going beyond these, as they are quite adequate for the combined instrument only.

**IMPORTANT MULTIMETER**
BARGAINS FOR THE RADIO ENTHUSIAST

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Central 4311

SPECIAL SNAP BARGAINS

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Douglas C. Macalister

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The A.M. B. Machine Co. Ltd., 26 East India Dock Road, London E.1, have recently developed a new automatic winding machine that has been designed for winding small or large coils, and is specifically adapted for the manufacture of cores and cores for transformers, and for the winding of cores and cores for transformers, and for the winding of cores and cores for transformers.

This machine is capable of winding cores and cores for transformers up to 12 in. diameter, and up to 4" in. height, and can be used for winding cores and cores for transformers, and for the winding of cores and cores for transformers.

The winding speed is adjustable, and the machine can be operated at speeds up to 2,000 r.p.m.

For information, visit the machine at the following address:

26 East India Dock Road, London E.1.

ELECTRICAL EQUIPMENT

BY J. M. B. Macalister & Co

(Manufacturers of Electrical Apparatus and Components)

Address:

26 East India Dock Road, London E.1.
overheated.
showed every sign of being badly
decided to check the wiring very
of the new vibrator. Alternatively,
which would account for the failure
ceed with further investigations at a
of distress in the leads. A voltmeter
the clip touched the battery, and
gingerly applied some power.
conked. I replaced these, went over
leads still continuous, although their
possibly the filament network.
in the primary circuit, including
there might have been a direct short
some time of the primary circuit,
vibrator had stuck and burnt out
termination to the battery leads, which
led and can be "dressed" with a mag-
Here is another angle on audio amplifier design which may prove of interest to many audio enthusiasts. The four valves in the output stage act as two valves insofar as stage gain and drive requirements are concerned, and this, our contributor points out, results in some special features.

THE details of this amplifier come from Mr. J. Miller of 21 Sutherland St., Lane Cove, Sydney, NSW, who is very keen about its performance.

The circuit diagram shows push-pull 6V6-GTs driven by push-pull 6SJ7-GTs. A feedback loop is taken from each 6V6-GT plate to the respective cathode circuit of the 6SJ7-GTs. The degree of feedback is such that the 6SJ7-GTs contribute little or no gain.

Mr. Miller points out that this reduces the effective plate resistance of the 6V6-GTs from 52,000 ohms each to something like 30 ohms each and the output distortion to less than .05% total.

The two push-pull stages must be considered as a composite group so that the figures for drive requirements and overall gain of a conventional 6V6-GT stage must now be applied to the grids of the push-pull 6SJ7-GTs. Consequently, a pick-up capable of about .5 volt RMS output would be required at the input terminals to drive the amplifier to Mr. Miller's quoted output of 8.5 watts.

Between the two push-pull stages, the degree of feedback is virtually constant at all frequencies. There is, however, an additional feedback loop from the cathode of the "upper" 6SJ7-GT to the screen of the input stage. This feedback is effective only in the middle and upper register only so that there is an apparent boost of the bass frequencies. The point at which this effect commences to operate is open to adjustment by the "bass boost" potentiometer in this feedback loop.

A special feature of the machine is that musical notes can be printed where wanted without rotating of the platen. Included is a device by which musically lined paper may be aligned selectively in position for impression of notes corresponding to either base or treble staff.

MUSIC TYPEWRITER

It is easy to write musical notes on any desired line or space of a printed staff with a special type-writer patented by Carroll E. Brizardine of Burbank, California. Keys are provided to print all the customary symbols employed in sheet music.

A special feature of the machine is that musical notes can be printed where wanted without rotating of the platen. Included is a device by which musically lined paper may be aligned selectively in position for impression of notes corresponding to either base or treble staff.
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- English motor and very reliable.
- Complete with turntable.
- £7/18/6

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"KAR KIT"

- Described in Radio and Hobbies.
- Complete 5 Valve Kit including miniature components, Rola Speaker, etc.
- Suitable for all makes of cars.
- £19/19/5

Value for Money with these

ENGLISH 2 SPEED GRAMO MOTORS

- £10/6/6 and 10/11/6

This 200-240 volts A.C. Motor combines dual purpose for standard and long playing records.

This 200-240 volts A.C. Motor combines dual purpose for standard and long playing records.

3-WAY PICK-UP by COLORING

- For Standard and Long-Playing Records.

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1. Use 33 1/3, 45, 78 r.p.m.
2. Output 70 Millivolts.
3. Frequency Range 30.16,000 cps.
4. Coil Impedance 3000 ohms.

IMMEDIATE DELIVERY.

ACO-CRYSTAL PICK-UPS

- Standard and Long-Playing Records.

- FEATURES AND SPECIFICATIONS
  1. Use 33 1/3, 45, 78 r.p.m.
  2. Output 70 Millivolts.
  3. Frequency Range 30.16,000 cps.
  4. Coil Impedance 3000 ohms.

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The successful applicant will be required to undergo medical and character examinations and will be required to undertake a training course of about one year at the Radio Officers' College, Sydney, and at the Central Training School, London.

Applications, with full particulars of experience and qualifications, should be addressed to the Secretary, Ministry of Defence, Canberra, and be accompanied by a recent photograph.

For further information call, write or phone:

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TELEPHONE: EAGLE 3111

PAGE SEVENTY-TWO
HOW TO FIND THE RIGHT EXPOSURE

What exposure will I give? is probably the most frequent question asked by the beginner, to whom the array of shutter speeds, lens stops and film speeds only means greater confusion. In this article we discuss the factors effecting exposure and describe a simple calculator which will give you the correct exposure in a few seconds.

The first step in the production of a photograph is the exposure of the negative. On the correctness of this exposure depends the quality of the final print, or even the chances of getting a good print at all. In some cases the error is such that the print is of very poor quality, lacking in contrast and details in detail in the shadows. Greater errors result in an unrecognisable negative which is of little value. However, there is a point at which a poor negative is still usable. This is the minimum safe exposure. Any increase above this amount results in the picture being of poor quality, lacking in contrast and detail in the shadows. The error is usually determined by the sensitivity of the emulsion, so that the factors affecting exposure are:—strength of light, time, and emulsion sensitivity.

Camera adjustments

Since the camera must be adjusted to cope with these changes it becomes necessary to establish a series of light values which can be recognised by virtue of the conditions affecting them, rather than by trying to judge how bright the light appears to the eye. Assuming that we can assign a numerical value to all the factors mentioned, we are then faced with the problem of balancing one against the other to arrive at an exposure value. The process is likely to call for some mental gymnastics, unless we enlist the aid of some form of calculator, and this is the idea behind the device shown at the beginning of the article.

The reader will already have

by Philip Watson

RADIO AND HOBBIES FOR AUGUST, 1961
**American Radar Transmitter**  
Type ASB

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 VOLT MIDGET MOTORS</td>
<td>SHUNT WOUND</td>
</tr>
<tr>
<td>AMERICAN CONTROL BOX APX-1</td>
<td>Push-button switches</td>
</tr>
<tr>
<td>HIGH POWER I.R.C. RHEOSTATS</td>
<td>Modulator</td>
</tr>
<tr>
<td>MODULATOR</td>
<td>Power supply</td>
</tr>
<tr>
<td>ELECTRIC LANTERNS</td>
<td>4W FLUORESCENT LAMP</td>
</tr>
<tr>
<td>6-VOLT VIBRATOR SUPPLY</td>
<td>WESTINGHOUSE VOLTAGE REGULATOR</td>
</tr>
</tbody>
</table>

Ideal voltage control for aircraft and home electrical generators, etc. 50/60-cycle A.C. 0-3 (0.1 mA. Theimocouple New) | 0-3 (10 mA., Theimocouple New) | 0-3 (100 mA., Theimocouple New) | 0-3 (1 A., Theimocouple New) |

**ELECTRONIC EQUIPMENT CO.**  
29b West St., Lewisham, Sydney.  
L428533
gained some idea of the meaning of lens stop markings from Lust Monui's article, and will recognize the system on the calculator as that adopted in English-speaking countries. To avoid confusion, we have deliberately indicated the four light conditions shown. The first presents little difficulty, and is simply the full sunlight condition. The second is that when the sun is covered by light cloud, is still visible and is strong enough (but only just) to throw a shadow. The third is a dull condition, when there are no defined shadows, but the position of the sun can just be determined. The final condition is dull with no shadows and the position of the sun.

It these are not available it second at 111. Some models two or three smaller stops are well. These will probably be 1.1 and 2.2 of reducing the exposure under bright conditions, it should still be a longer exposure.

This is the system which we have chosen for our calculator, and we are including a table of speed numbers for popular films on the Australian market. You will note that each third figure has been given a prominent marking and bolder type, which is to emphasize that the difference between these values is equal to one standard stop number of the lens marking system. Thus an increase in sensitivity from 50 to 100 means that the same negative exposure may be obtained with one stop smaller, or with half the exposure time.

As already mentioned, the selection of light values presents the greatest problem. The figures shown on the calculator have been taken from the scale of a light sensitive meter and this has been used to collect data on daylight values over a wide range of weather conditions extending over many months. This data has been made into simple table form, and you should have no difficulty in selecting a value to suit prevailing conditions. The unmarked divisions represent values midway between those marked (450, 225, &c.), the scale being nonlinear.

To use this table correctly it is important to have the correct value to suit your exposure. The exposure scale is marked 8 to 16, which is 0.8 to 1.6. The calculator is marked in one stop numbers, and this is equal to one stop of the lens marking system. Thus an increase in sensitivity from 50 to 100 means that the same negative exposure may be obtained with one stop smaller, or with half the exposure time.

As already mentioned, the selection of light values presents the greatest problem. The figures shown on the calculator have been taken from the scale of a light sensitive meter and this has been used to collect data on daylight values over a wide range of weather conditions extending over many months. This data has been made into simple table form, and you should have no difficulty in selecting a value to suit prevailing conditions. The unmarked divisions represent values midway between those marked (450, 225, &c.), the scale being nonlinear.
The greater exposure. It you are varying exposure by means of the lens opening it is quite probable simple light of light and cannot tolerate a slower shutter speed. Otherwiseset the diaphragm to the user up.

---

wait until you are ready in the centre disc on the card, they may be held together with a drawing pin. Another idea is to mount the body on a 18-gauge wire and lap the centre hole to take a 1-in. bulb. In this case it would be advisable to make the necessary adjustments if there is a permanent change in conditions.

The effect of subject matter on exposure needs to be considered, but is often claimed. The exposures result from the calculator are based on average subjects, that is, they assume a certain amount of dark clothing and shadow areas in which detail should be retained.

---

**SPECIAL CASE**

Assuming that the exposure is correct for this subject, what will happen when these dark areas are no longer present, as, for example, when photographing players in light clothing on a tennis court? Should the exposure be decreased, and will overexposure result if it is not? The answer to this is that the exposure may be decreased if there is any advantage in so doing, but it is not essential to do so. The negative will not be overexposed in the true sense of the term. Admittedly it may be a little more dense than usual, but it will still be capable of giving a perfectly satisfactory print, indistinguishable from that made from the "correctly" exposed negative.

Similar subjects would be beach scenes and shots taken on the water where one stop smaller can be used in most cases. On the other hand, subjects of a dark nature may be given an increase in exposure and, in fact, this is often essential if maximum detail is to be preserved. Into this category come animals with dark coats or subjects with large shadow areas in which detail is required, fine or two stops larger can safely be used in these cases.

---

The only objection is that it is a little large and there is rather more separation between the cards than is desirable. A smaller type may overcome these difficulties, something along the lines of a glove fastener possibly being better.

No matter what is used care should be taken to eliminate rubbing on the paper.
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SPECIALS
MKTKKS, II-1 Mill/Amp Meters. 24 face full scale deflection
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A 576MC TRANS-RECEIVER

(Continued from Page 63)

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Following is a brief description of some items available:

Tape-Deck TYPE M for Hi-Fi reproduction. All the features of Type L and more features. Price 30/6. 

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6v 5 amp 5/-
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0-10 Weston Ammeters 50/-.
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Builds up air pressure to 3000 H.P.M. Develops up to 1200 lbs. per square in. of hydraulic pressure will pump 7½ gals. S.A.E. oil or other liquids per minute. Useful for spraying, milking, presses, oil burners, hydraulic systems.

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0-10 Weston Ammeters 50/-. 1½” diameter, 32/6.

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Ideal for Generators, 57/6, 0-1 Milliammeters, 1½” diameter, 32/6.

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12ft long, 3 sections. Each section 4½. 2¾. RI long, 2 sections £7/6.

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Will measure inside and outside. Can also be used as Depth Gauge.

Works of ins. and mm. Can be carried in the pocket.

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47/6

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Genuine English RAF Mk. 8 Flying Goggles, Brand New, 48/-
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72" long tape 100 and 1 pair
Handy Pocket Size. Ideal for all types of work.

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JUST ARRIVED! ARMY GROUNDSHEET AND CAPE
Ideal for campers, cyclists, hikers.

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2.2 cubic feet, will pump up to 75 psi. Never before at this price. Ideal for £11/10/-.

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Genuine British 4 Draw, 22 Magnification, Rifle Range Telescopes, 32/6. BRAND NEW Pocket Pneumatics, 85/-; Brand New English Binoculars, 15/- pair. American Red Wing Glasses, 3/-; Dental Inspection Mirrors, 4/6. 20-20 Car Type Stop Meters 12/6. Handmade Style rear view mirrors. £15/- Model English spirit prismatic glasses 18/-.

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10-50 Amps 32/6
100-500 Amps 100/-
0-5 RF Voltmeters 25/-
0-500 Voltmeters 25/-
8-10 Amp A.M.P. Meters 6/6

Radio and Hobbies for August, 1951

PAGE EIGHTY ONE
ask for insist on demand

KINGSLEY
THE GREAT NAME IN AUSTRALIAN RADIO

Tuning Units Coils & Components

of QUALITY

KINGSLEY RADIO
3 CORNELL PLACE, CARLTON, FJ5409
LET'S BUY AN ARGUMENT
(Continued from Page 27)
and fall even dismaying altogether in sympathy with the principles of the universe. That these stars are more likely to blow up nowadays than they have been at any other time, is more to learn about the basic forces of the universe than in any other place.

A peculiarity of these phenomena is that the light from the great Novae is more intense than the red light, some with a green light and some with a blue white light. It is known for certain that these Novae are explosions in the hydrogen, and energy is given out from these Novae. Now, these explosions in the hydrogen seem to be increasing from year to year.

Thus, between 1850 and 1900 witnessed only three Novae but since 1800 the number of Novae witnessed has been much more than in the previous fifty years. The years between 1850 and 1900, the great Novae send out radiation which affects on the stream of cosmic par- effects on the stream of cosmic par-

ton of what are called dwarf stars. These dwarf stars glow with a dull white light. It is believed that these dwarf stars are black dwarfs even heavier.

The admirers of radio and phonograph theory may have a stimulating aspect but I'm not trying to be discouraging. There is an association between the formulas and quantities involved in the various branches of physics. The admixture of radio and phonograph theory may have a stimulating aspect but I'm not trying to be discouraging. There is a striking similarity between the formulas and quantities involved in the various branches of physics.

The multihit exposure
(Continued from Page 27)

Each month five in midwinter when 6ft from the glass.

As you become more experienced with the apparatus you can begin to do experiments under less favorable conditions but, if you use the apparatus under favorable conditions, that is important that you accept the de-

THE RIGHT EXPOSURE
(Continued from Page 77)

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THE RIGHT EXPOSURE
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THE RIGHT EXPOSURE
(Continued from Page 77)

As you become more experienced with the apparatus you can begin to do experiments under less favorable conditions but, if you use the apparatus under favorable conditions, that is important that you accept the de-
There have always been programmes in English from Moscow, but in the past these have been confined to about half an hour at different times, and directed to various countries, depending on the particular "times of the broadcast."

LATLTY, however, there has been a big expansion; these broadcasts and an example of this, Moscow now transmits forty minutes daily directed to South America.

The times and frequencies for this ter- minal English service are the following: Monday night, 8.45 pm-9.25 pm. Thursday and Saturday nights, 8.30 pm-9.10 pm. Sunday nights, 7.00 pm-7.40 pm and 9.00 pm-9.40 pm. During the period 11.30 am to 2.00 pm they use the frequencies 9.55 mc, 11.82 mc, 15.11 mc, and 15.18 mc. At these times they are heard in the British Isles but at lime of writ- ing we do not know the times or the places. There is also another program directed to North America, which usually obtains its informa- tion...
amateurs but only members of the WIA. The period of operation of any station is larger stages on more even terms with the rules in an endeavor to place the ITACH year a considerable number of used. ards eligible for the awards. brance Day if using phone. contacts on other bands will not be per- of the operator concerned. of these will lead to the disqualification used and all transmissions must conform deavor to contact amateurs in other bands. Scoring:—12. In order to provide an Logs: —14. The log submitted must serial numbers to be exchanged must take place before any points may be deposited in the log staling the regulations (Rule 6) must be attached at the conclusion of the log. RST/No., time of QSO, points claimed. 356.0x1224.0
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The newest and most practical of all the modern electronic devices is the HI-FIDELITY MAGNETIC TAPE RECORDER. This marvelous little machine enables you to record sound in a form which is more permanent, more reliable and more realistic than any other means. It is compact, convenient and it is now available for home use.

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Price: $387.90

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PAGE EIGHTY-SEVEN
THE LITTLE GENERAL Grows-Up

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136 Victoria Rd., Marrickville
TUNING CIRCUITS FOR RECEIVERS

Capacitors would have their range altered to cover 35 to 125 mmfd. by connecting a 25 mmfd. auxiliary condenser in parallel. And if the auxiliary capacitance is made equal in 100 mmfd., the lower capacitance range will become 110 to 200 mmfd.

If the auxiliary (trimmer) condenser were variable, there are values of 25 and 50 mmfd., then a number of maximum and minimum values (and corresponding bandwidths) could be observed by properly setting it.

By application of relations (1) and (R1) various frequency ranges could be determined.

It must be remembered, of course, that where C appears in those equations and formulas it is taken in the complex term appearing on the right-hand side in (10).

If the value of C2 is reduced to 500 mmfd., the range becomes 8.3 to 33.3 mmfd., and if it is reduced further (to 20 mmfd.), the range becomes 7.1 to 20 mmfd.

Note also that as C2 is reduced in capacitance it has less reducing effect upon the maximum value of C1, while at the same time not altering (the C1 minimum tremendously.

An interesting arrangement is shown in Figure 5 with both trimmer (C1) and pudther (C2) made variable to achieve any desired amount of bandspread or bandwidth.

NEW HYDROPHONE

A TOTA! different, way of picking up sounds in a liquid, with possible application to submarine detection, was recently reported to the Acoustical Society of America.

RADIO TECHNICIAN

do YOU like this atmosphere?
can YOU pass this test?

RADIO AND HOBBY, VOL. 5, NO. 1, AUGUST, 1955
This month the microgroove record has reappeared in the news with a bang which has echoed throughout the land. It is the result of a visit to Australia by a representative of the Decca company of England, with a pile of records in one hand and an assortment of reproducing equipment in the other.

BY JOHN MOYLE

What would be the work of a hiss in Australia is a subject in his respectful, but Mr. Heppner, controller, unhesitatingly, the idea of a multi-channel record is a fact. It is not. (Heppner has details of the epoch-making process and is in action for the two new systems through the actions as far as the limits of most reports are concerned. That inevitable union of the sss and the supply has not been.

Mr. Stevens, I can say...
equipment must make him able to answer the question, "How can I play these records on my radio-gram?" and provide the equipment as the standard record for it.

J.H. MAGRATH & CO.
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HE LB OUR ME C.I. CENT. 36BB.

PI.AVBACK RECORDING SLIPMF.S.

TWO SPEEDS

Leaving Mr. Stevens and his opinions, in the main I agree with him. I am more and more inclined to think that the light stuff will be on 78, and the more serious music gradually changed over to the 33 speed. I am not overlooking the possibility of EMi coming out with an entirely new scheme possibly based on the "super 45" player, to use my coined phrase, but I don't think so.

In practice, it can, I think, be shown that in a few cases—mainly near the end of 10-inch records—45 rpm has the edge, but in practice there is nothing to choose between the two speeds for quality. Elsewhere the 33 speed heads the 45, and in any case, provides that vital extra playing time.

These matters aren't just guesswork—they have been worked out mathematically and can be demonstrated. Bearing in mind the other links in the chain which can make or mar reproduction, I don't think the 45 record can justify its disadvantages.

The Decca-playing equipment—playing desks, amplifiers and speakers will probably be distributed here through a separate company from LMI. Incidentally, Decca have a novel vented speaker of only 4 inches in diameter in which the enclosure is a narrow box about 3 ft 6 in high and intended to face into the corner of the room. The sound bounces off the wall to give sound diffusion. I was most interested in this speaker, not only because it follows an idea suggested recently in these columns, but also because it worked so well.

HIGH COST

Unfortunately. the price of these speakers—probably over £50—and of the motor pickup playing desks—about £35 complete—seem too high. Nor is it necessary to spend money on this type to get good results. Super quality has always been expensive, but a more modest, solution than this should be affordable in the interests of Mr. General Public. The home builder can buy a suitable motor and pickup for £10-£12, and can easily arrange to house them, using his present cabinet in...

Apart altogether from Decca's activities, it is to be hoped that the move to better recording will soon become universal. Maybe others have much to lose at the moment.

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We specialise in Radio Ports and stack all reliable brands. We can supply: Coils, P's, Transformers, Resistors, Tubular Condensers, Valves, Wires, Flex, Meters, Testing Equipment, Radio Manuals, Irons, Toasters, Pressure Cookers, Toasting Irons, Trimmers, Padders, Gang Condensers, Cabinets, Motor and Pickups, Record Changers, Solder Irons, Solder and Electrical Accessories, series, 4 and 5 Valve Mantel sets -Portable sets, Console Radio and Radiograms, etc. Mantel, Console and Radio-gram cabinets, TECNICO Electric Lawn Mowers, TECNICO, PHILIPS and TELEVERTA Radio Sets.

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32V input. 240V AC

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I. Mr. for your subscription

E.X.B. It has been informed by the subscription department and you should handle.

Beethoven, we feel that you may like to see some difficulty in pinning this. A check with a few of the larger musical firms in Sydney reveals that it has been cut out of the current catalogue and there is no indication as to its reappearance. We cannot employ the suppressor-to-

C.G. (Ballarran, NSW) sends circuit

YOUR query:

1. Queries will be answered in relation through the columns of our magazine if not accompanied by a fee for a postal reply.

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3. Back numbers are rarely available but reprints of most circuits, wiring diagrams, and parts lists will be supplied for 6d each, minimum charge 1/-. Thus a circuit, layout, and parts list will cost 1/6 in stamps or a postal note. Endorse envelope "Circuit."

4. Blueprints of each size chassis layout and cut-outs will be supplied if available for 2/6. Endorse envelope "Blueprint."

Address your letters to the Technical Editor, "Radio & Hobbies," Box 2729C GPO, Sydney.

ard subscription might be belts

investigate the possibility of a

niche instrument. We believe

enough gain for a

crystal type in an amplifier to find

at some common earth point associated with the filament or B-minus circuits.

K.K. (Berry, NSW) sends 12 months' 
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MAGNETIC RECORDING

(Continued from Page 35)

Signers have compromised by using a second motor for this function. An alternative idea is a "teeter-bar" system, by which either one of two transfer rollers is brought into contact with the master flywheel. In one position the drive is transmitted through a belt or clutch to the take-up spool. In the other position, the drive is removed from this chain and transferred to a high-speed reverse drive for rewind. A similar effect can be obtained by transferring the drive to a reverse drive for rewind. A similar effect can be obtained by transferring the drive to a high-speed reverse drive for rewind.

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(Continued from Page 35)

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MIGHTY SUNSPOTS

One of the biggest sunspots ever observed recently appeared on the face of the sun, with a consequence severe effect on radio communications.

The spot was estimated at being 100,000 miles long and 250,000 miles wide. That's quite an area even in our enormous universe. What a power factory is the sun which can keep up disturbances on that scale century after century, with an apparent change! It makes our own efforts less than child's play.

MAGNETIC RECORDING

(Continued from previous page)

The vital point is not so much the actual width of the recorded track but the alignment of the tape with the gap and the most intimate possible contact. Any tendency for the tape to buckle away from the gap or to lose in the wrong position on the head, has a major effect on the performance of the unit.

WANTED TO BUY


FOR SALE: Speaker. 12", recording type. $5. Suitable for "Harmonica".

FOR SALE: Wireless speaker. 5 watts, £8. Pleas for list.

FOR SALE: Wireless 15w. Transmitter, receiver. £10. Available this week.

FOR SALE: 22H frontal, 10w. Hi-fi speaker. £10.00.

FOR SALE: Sound amplifier. £7, 0. Write for list.

FOR SALE: Two 12 inch Magnavox theatre speakers. £9/10/-. J. Bray, 6 Rawson St., Sans Souci, N.S.W.

FOR SALE: Two 10 inch Magnavox home speakers. £7/5/-. J. Bray, 6 Rawson St., Sans Souci, N.S.W.

FOR SALE: Jet Age radio in cabinet. £12.00, 230v. A.C. Only, needs 168 Marlon St., Leichhardt, N.S.W.

FOR SALE: Queen of Scotland. £1.00. 168 Marlon St., Leichhardt, N.S.W.

FOR SALE: Valves for Philco. £1.00 each. B. Bayliss, 168 Marlon St., Leichhardt, N.S.W.

FOR SALE: Air filter, jet age, £1.00 each. B. Bayliss, 168 Marlon St., Leichhardt, N.S.W.

FOR SALE: Receiver, jet age, £1.00 each. B. Bayliss, 168 Marlon St., Leichhardt, N.S.W.


FOR SALE: "Royce" 12" recording reproducer, £60 or best offer. K. Echlin, 105 Perouse St., Homebush, N.S.W.

FOR SALE: "Trade" Midget Condenser. 30 microns. £1.00 each. B. Bayliss, 168 Marlon St., Leichhardt, N.S.W.

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