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No. 3

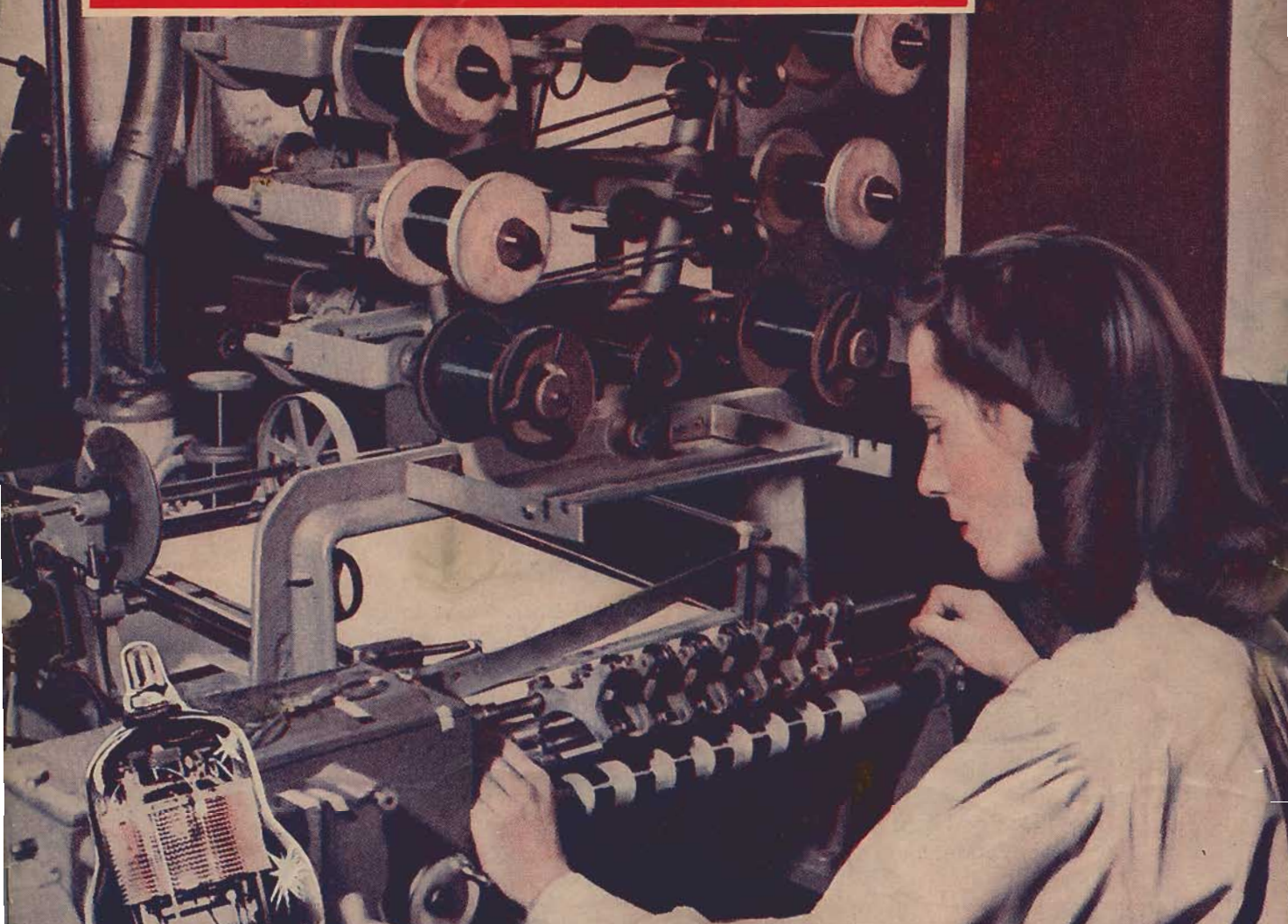
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Editorial



PEOPLE sometimes ask me why in a journal essentially concerned with radio I include articles and pictures which do not deal directly with radio at all. In fact when our paper was first begun, at least one man, well-informed in journalistic matters, prophesied that it could not succeed because it was called Radio & Hobbies. We have proved his ideas to be wrong. They were wrong because, as we realised, radio is not a thing unto itself. Only a narrow and short-sighted outlook imagines that it is.

It might not be out of place to quote portion of the editorial which appeared in the first issue of Radio & Hobbies. It is nearly ten years since I wrote it, but it is just as true today as it was then.

"Radio itself isn't just a single subject," I wrote, "It is a whole host of subjects. It covers electricity, mechanics, and sound. It has its romance, its mathematics. It can lead us into hundreds of little byways, each of which must be traversed in print, somewhere or other, in a journal such as this. No other hobby can teach you so much about the wonders of the world in which you live. But radio as a hobby is essentially something which leads to action, to experimenting. It has this in common with so many hobbies which provide our hands with something to do. It is fitting that we should deal with other activities which are thus allied to radio itself."

Even in those days, I did not fully realise how true those words could be. It took years of experience, including the lessons of a world war, to make the point clear. What I realise now, as do so many others, is that the applications of radio are so vast that we cannot neglect knowledge of other sciences if its background is to be preserved. Who can fail for instance, to see that recent research into the primary atom was made possible only by applications of radio and electronics? Who can know what applications either of these is likely to have to natural phenomena in the future?

And so, although when the first Editorial was written, I was mentally occupied more with radio as an entity, I now see it in a much wider light as part of fundamental science. We must be prepared to recognise this viewpoint if we are to build up and preserve the background which will give the fullest possible significance to radio as we know it.

That is why you will find in our pages articles which haven't any bearing on making radio receivers or transmitters. But they are all calculated to interest you in the general scheme of the universe, in the fields of which the electronic research engineer, and the scientist, are continually meeting on common ground. No radio engineer of any note today considers he can be worthy of the name if he confines himself to volts, amps, and slide rules. He is for ever searching the natural phenomena of the universe to find wider knowledge, and wider application for his own art.

Remember this when you scan through Radio & Hobbies each month. It may be that we cannot highlight this background to radio as well as we would like. But it is the reason why we think we are justified in trying. In fact, in this modern age there is no other way to interpret our accepted responsibility in publishing our paper.

John Moyle

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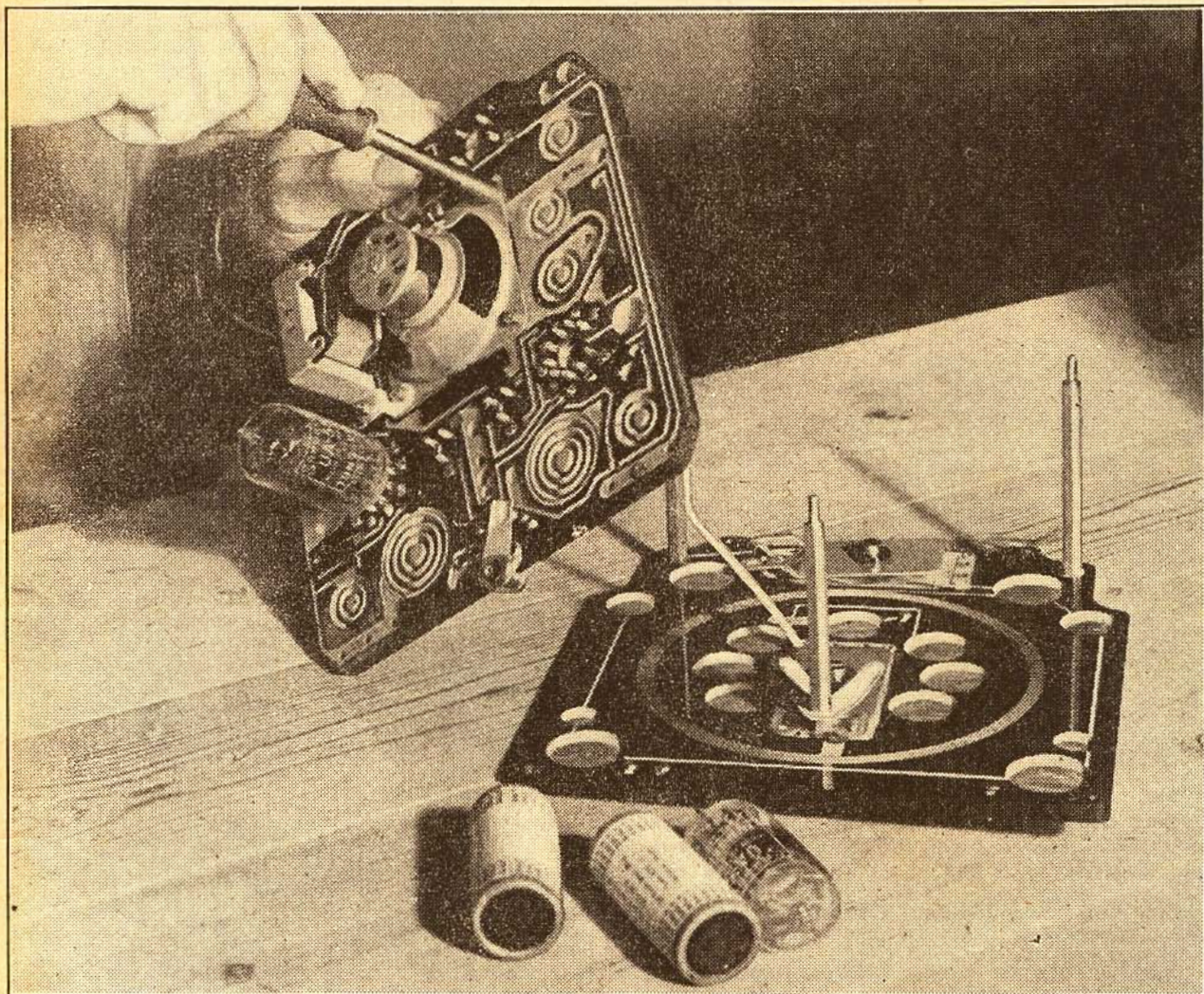
THE ROLA LOUD SPEAKER REPAIR GUIDE

Available now through Rola distributors in all States and from the Rola Co. (Aust.) Pty. Ltd., the Rola Loud Speaker Repair Guide gives detailed information about how to have a Rola Loud Speaker repaired if and when necessary. Be sure you obtain a copy for future reference.

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PRINTED CIRCUITS IN A BIG WAY



Overseas, printed circuits are going ahead like wildfire. Endless applications are being found for them in every branch of radio, and for that matter, in electronics generally. Suitable mainly for mass production on a large scale, they have not officially been used as yet in Australia, although doubtless many experiments have been made with an eye to the future

FROM time to time, we have mentioned the use of "printed circuits" in radio, in which the wiring, and even components such as resistors, are actually printed on specially prepared plates by machinery, thus reducing to a minimum the amount of work which has to be done by hand.

The picture above is an excellent one, and shows the operator screwing the loudspeaker into place. On the table are two of the condensers too large to be "sprayed," and one of the valves, the other being already plugged into the chassis.

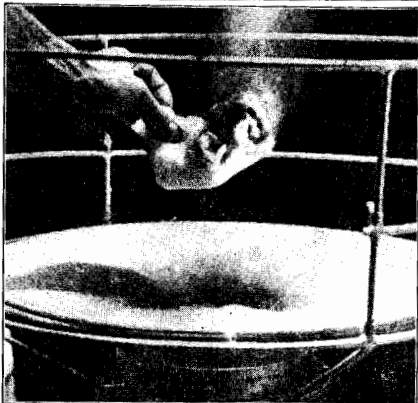
Although the receiver shown here is a comparatively large model physically, the greatest use for printed circuits is found in miniature sets and hearing aids, where space is an all-important factor.

Printed circuits were used initially in the tiny

radar receivers, one of which was fitted into every shell fired from guns featuring the proximity fuse. This was a radar device which allowed the shell to explode within a given distance of a target, even though a direct hit was not obtained. The enormous number of such receivers required was far beyond the capabilities of normal construction methods, apart from the extra space which such methods would have demanded. Valves used in these fuses were of the type now being used for hearing aids, and during the war, more than 130 million were made, capable of withstanding gun shocks 20 thousand times that of gravity.

In America, particularly, where small portable transceivers are coming into use, the new technique is being widely used, printed circuits proving to be the answer for convenience and mass production. Aircraft radio sets are also expected to be better and lighter with printed circuits.

THE MAGIC OF SUPER SONIC SOUND



Recent Press reports referred to overseas experiments with sound waves beyond the audible range, and the fascinating results obtained with them when generated with sufficient power. Information and pictures now received throw more light on what these sound waves can do.

THE key item is a sound siren capable of generating sounds up to 30 kc. Compressed air is forced into the siren, and escapes through 100 small holes in its head. Revolving beneath these holes is a rotor with 100 teeth. When set in motion, the

rotor stops and starts the flow of air at a rate depending on its speed. It requires a speed of 20,000 revolutions per minute to produce a frequency of 30,000 cycles.

The amount of power in sound waves generated by the siren is equal

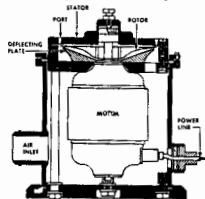
A pad of cotton wool igniting when held over the sound generator. The higher frequencies may be focused and reflected like light waves.

to 2000 watts, about one thousand times as great as the sound energy of an ordinary radio set played at loud volume. When this energy, or part of it, is absorbed by objects placed in the sound path its effect on them is profound.

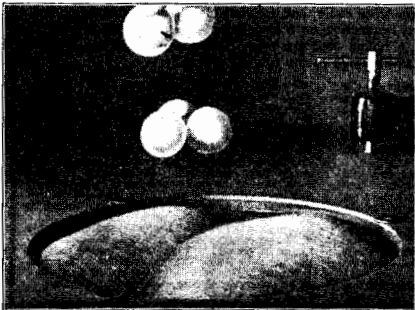
Our picture shows a piece of cotton wool being held over the siren. It absorbs enough energy to burst into flame after a few seconds. A kettle of water suspended over the siren will boil in about six minutes for the same reason. The tobacco in a pipe can be ignited by it.

All objects do not absorb sounds of the same frequency at the same rate. Consequently the sound frequency may be varied to obtain different effects. It requires a 3000-cycle note to suspend the marbles in air, as shown in the lower picture. As this frequency is well within the audible range, the operator would require ear plugs and rubber muffs to avoid damage to his hands and ears by the intense sound power.

Various uses are predicted for sound energy of various frequencies.



Cross-section of the siren showing air inlet, sound holes or posts, and rotor.



Bacteria and germs, and even small animals and birds, can be killed by the heat generated within them. Smoke, soot, &c., can be loosened, and the dirt removed from clothes by literally shaking it out.

Smoke and fog can be precipitated from the air by striking the correct sound waves. When frequencies are used within the hearing range of birds and animals they can be scared away most effectively. Milk may be homogenised, and commercial compounds such as face-creams "mixed" quickly and efficiently.

One-inch glass marbles being suspended in air in a sound stream of 3000 cycles.

PHOTO-CELL PROBES LIFE ON MARS

By

THOMAS R. HENRY

The possibility of life on Mars has become more feasible by a report of finding in the thin atmosphere of the red planet nearly twice the amount of carbon dioxide—one of life's three essentials — as exists in the earth's atmosphere.

THIS was reported to the American Association for the Advancement of Science by Dr. Gerald Kuiper, director of the Yerkes Observatory at Williams Bay, Wisconsin. It has long been known that Mars has a thin atmosphere but, Dr. Kuiper said, only with the war development of astronomy's latest tool, the extremely sensitive lead-sulphide photoelectric cell, has it been possible to tell anything of its composition. The presence of carbon dioxide was determined by the fact that this gas, necessary for all plant life, strongly absorbs certain bands of invisible infrared light.

LIFE ESSENTIALS

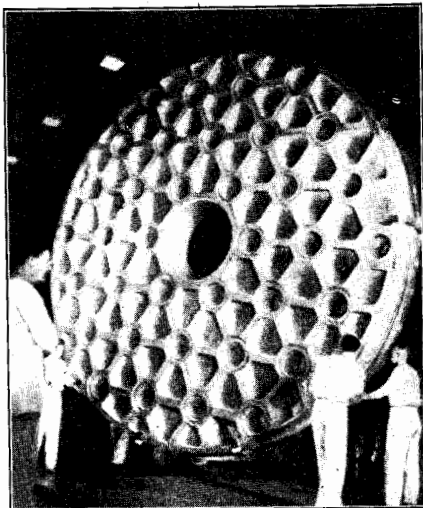
There are two other essentials for plant life: A small amount of water and some form of soluble nitrogen. The north and south poles of the planet are covered with what look like great icecaps. There is no certainty, however, that these are frozen water. They may be dry ice, or frozen carbon dioxide. It will be possible to settle this question with the same sensitive gadget, Dr. Kuiper said, by observations during February when Mars will be within about 68,000,000 miles of the earth.

This will leave only nitrogen out of the life picture. Nitrogen in the earth's atmosphere is transformed into ammonia by lightning and comes to the earth as rain. Approximately 100,000,000 tons of this ammonia falls each year, according to Dr. Kuiper, and it makes life on earth possible. He also pointed out that there definitely is no rain on Mars, but ammonia may be produced by "dry lightning" due to atmospheric electricity in dust storms.

MARS VEGETATION

There are large areas on Mars which turn green with the advancing seasons, like vegetation of earth. The lead-sulphide cell, Kuiper said, will make it possible to determine whether this Martian vegetation, if it really is vegetation, is made up of grasses or of mosses and lichens.

The great probability, the astronomer said, is that the green areas, covering thousands of square miles, will turn out to be great fields of



GIANT EYE TO SEARCH THE SKY.—Ground and polished to within two-millionths of an inch, the 200-inch telescope mirror for the Palomar Mountain Observatory was carefully packed in an insulated wooden box for its trip up the mountain. Under preparation since 1936, the giant mirror and its supports weigh about 37 tons. Because of the extreme accuracy of the parabolic shape, any scratch would ruin the mirror, so workmen wore dust-proof tennis shoes and special clothing while handling the huge piece of glass.

lichens growing over bare rock. This is the hardest form of life on earth and is the most likely to have gotten a foothold on the far less hospitable sister planet.

Probability that any evidence of animal life can be found is very remote, Dr. Kuiper said. He compared the likely climatic conditions there as those of a desert 10 miles high. There are no lakes or streams and all animal life on earth, is known to have originated in water. Even if higher life could exist today on Mars it is highly unlikely that it could ever have got started.

Dr. Kuiper said that any life on Venus, the planet closest to the earth, is impossible. There is no water, and the atmosphere consists very largely of carbon dioxide. The sea-level

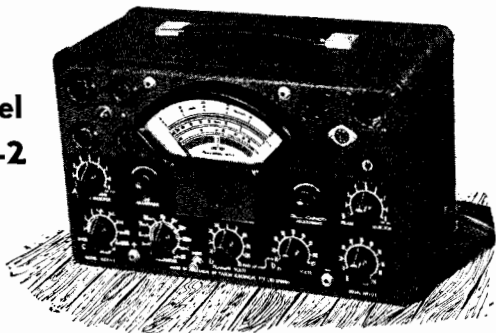
temperature on the sunlit side of the planet is very close to the boiling point. The surface of Venus is swept constantly by titanic dust storms.

POISONOUS AIR

Lead-sulphide cell observations, he said, also have confirmed the belief that the atmospheres of the great planets Jupiter and Saturn consist almost entirely of poisonous gases—ammonia and methane. These gases would make life in any way like that on earth impossible, even if it could exist in the extremely low temperatures. Dr. Kuiper also reported finding that the satellites of Jupiter and Saturn, some of them larger than the moon, have no atmospheres, although there is evidence that some of them may have had at one time.

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ECHOLESS ROOM HELPS NAVY TO FIGHT MINES

There is a weird room at the Naval ordnance laboratory in Washington whose inner walls are like the coat of a porcupine—where it is possible to hear your own voice; and if that sounds silly just try to hear your own voice out loud as you read this.

Almost everywhere else you actually hear a hundred or a thousand voices when you speak, or when anybody else speaks. You hear the original voice distorted by all the echoes from all the near-by surfaces and from all angles. It is virtually impossible ever to hear a pure sound anywhere—except in the strange "echoless" room which has been constructed there.

ABSOLUTE SILENCE

The walls of this large room are covered with large fibreglass wedges, each protruding about five feet, so arranged that no sound can "bounce" from them. The room has only one opening, and apparatus tested in it can be controlled from the outside. Not only is the room echoless, it is a place of absolute silence until it is used to determine with extreme precision the effect of some pure, absolutely undistorted sound.

From the naval standpoint, the experiments to be conducted there are of fundamental importance. Among their applications is the devising of even more sensitive acoustic mines—though, toward the end of the war, these were reaching uncanny efficiency. In its simplest form, the acoustic mine is set off by the sound produced by a ship directly above it. It must be so delicately adjusted that it will not be exploded by the sound of the ship in any other position.

ACOUSTIC MINES

Up to this point, however, it is a rather crude device. It could be outwitted easily by a minesweeper. The more refined mines will "count" the ships passing over them and explode only after a certain number have registered. Ten ships might sail over such a mine in complete safety while the eleventh would be blown out of the water.

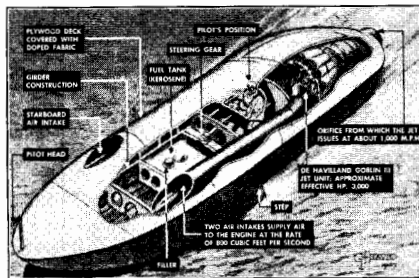
But even this is a mere starting point for the future developments which might come from the scientific study of "pure sounds," such as is made possible by the "echoless" room.

There are other rooms in the country where echo is reduced to the vanishing point. This one incorporates all their "anti-bounce" techniques and adds a few tricks of its

FLYING WITH MODEL SEAPLANE



The art of flying models attached to a line is here demonstrated by E. Adams, a member of the Model Aeronautical Society at a recent meeting. His "Aeronica" model is powered by an $\frac{1}{2}$ H.P. motor.



A cutaway picture of the Bluebird II, driven by a Rolls Royce Goblin jet engine with which Sir Malcolm Campbell will shortly attack the world's record.

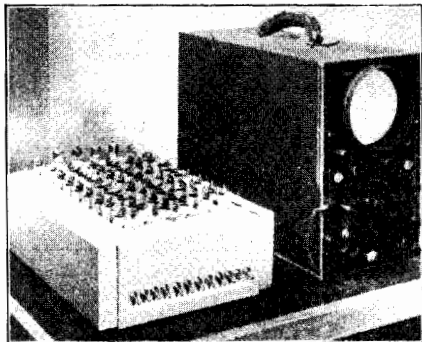
own. When it is desired to test the effects of a certain tone on a detecting device, the experimenters can be certain that the results are due to one sound only and not to a thousand other sounds with all sorts of intensities and all sorts of minute time intervals between them.

It is calculated that the specially constructed walls absorb 97 per cent of the pressure and 88 per cent of the energy of any sound wave which impinges on them. This is about as near complete absence of echo as can be attained on earth.



Technical Review

NUMEROSCOPE PRINTS ON C.R. TUBE



Modern electronic calculators operate with such speed and produce answers in such rapid sequence that electro-mechanical typewriters cannot successfully record the figures. From the Harvard University Computation Laboratory comes this description of an electronic device which prints the numbers on the screen of a C.R. tube, where they are photographed on high-speed film.

ELECTRONIC "brains" have undergone rapid development during the past few years, and it is not surprising that normal printing machines have been outpaced by the speed with which computations are now completed. The technique of displaying the results on a cathode ray screen for high-speed photography will overcome this problem. In practice, a whole array of tubes is employed to display the results.

To enable Arabic figures to be portrayed on a CR tube it was necessary to break the characters into horizontal and vertical components of displacement. The result was two voltage waveforms, which were then analysed for harmonic sine wave components.

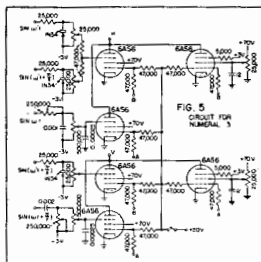
It was found that the characters

The complete numeroscope for the numbers 1 to 10 is shown above, with an oscilloscope for display. On the right is the circuit required to produce the numeral 3, and below, the group of numbers photographed from the face of the oscilloscope. Shutter speed was 1/10th second, but exposures at 1/500th sec. are possible.

could be resolved into straight line-broken lines, ellipses and half clips. Straight lines present no particular problem, while broken lines, as in the top of the figure 5, are produced by rectifying the two halves of a sine wave and applying the component through an electronic switch to the respective pairs of deflector plates.

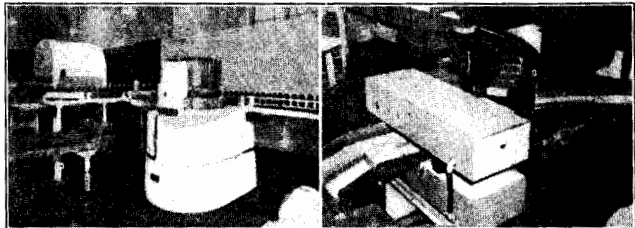
The semi-ellipse involves displaying the phase of signal on the respective sets of plates and using a square wave of the same frequency to suppress half the complete figure. Other special provisions are necessary to ensure correct sequence of writing and correct location of the line forming a single figure.

A separate circuit is necessary to produce each figure and the complexity is illustrated by the diagram necessary for the figure 3. The signal to the numeroscope consists of voltages at 2000 and 5500 c/s, as well as inverted sine waves of the tv frequencies. From this source the sections of the device evolve the required deflecting voltages. ("Electronics," Feb., '48.)



1234567890

METAL DETECTORS IN MODERN INDUSTRY



On the left an electronic beverage "inspector" is shown at work at a Coca Cola factory. On the right, cartons of candy undergo inspection for metal particles before final packing for delivery.

Electronic devices of various types are now being used to protect consumers against foreign bodies in their food, their drinks and their smokes. Latest device to join the ranks of these electronic "inspectors" is the RCA metal detector, which is already proving a boon to the plastic industry.

MANY of the dies used in the plastic industry are expensive and easily wrecked by metal particles which may find their way into the raw material and ultimately into the die itself. The subsequent delay and expense of repairing the die or replacing it can be a very costly business.

When the RCA equipment was installed for trial in the Victor record plant at Camden (NJ) its job was to "inspect" the vinylite biscuits from which the finished discs were to be pressed. In a three-week period it is estimated to have saved 1200 dollars by detecting "tramp" metal particles which would have caused severe damage to matrices or dies.

A similar installation at the Automotive Fibre Company, at Trenton, NJ, detected an imbedded blade knife during the first three hours of operation. Had the metal gone through the machinery unnoticed it is estimated that damage to the calender rolls would have cost 2000 dollars to repair.

HIGHLY SENSITIVE

Back in 1933 RCA developed a gun detector for use in prisons for detecting hidden weapons, hacksaw blades and similar contraband items. This was succeeded by a variation of the gun detector which was produced during the recent war for use at a Government arsenal to inspect cartons for remaining bullets.

These early equipments were constructed of wood, but continued research, carried out during the war for rocket fuel inspection, finally led to a metal detector made of metal. This notable refinement in design was

the forerunner of the flexible and dependable metal detector now available to industry.

The latest model metal detector is capable of detecting spherical metal particles as small as this letter "o." The whole unit is housed in a safety-sealed compartment, which can readily be cleaned, or even washed when necessary.

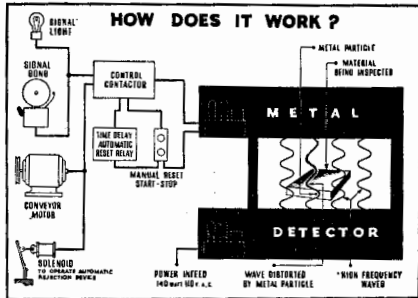
This feature makes the detector particularly valuable for use in candy plants or, indeed, any other food processing plant.

The whole unit can be made automatic in operation, so that a particle of metal passing through the detector field will ring a bell, operate a signal

light and stop the conveyor belt. If necessary, it is simple to arrange an automatic rejector device. There are obvious advantages over the older system involving X-ray inspection in a darkened chamber. Apart from the danger of X-ray exposure to the operator the fatigue factor is very high and small particles can easily be missed by lack of attention.

The detector has two compartments, one above the other, below the conveyor belt. Any metallic particles passing between them upset the equilibrium of a radio frequency field and actuates the alarm mechanism.

An interesting variation installed by RCA for the Goodyear Tyre and Rubber Co. detects flaws in tyre construction, despite their non-metallic nature. The tyre is rotated in a wetting bath, which provides efficient coupling between the detector and the controls.



The RCA metal detector actuates alarm devices, as required, when a radio frequency field between the two units is upset by the presence of a metal particle.



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NOW—AN ELECTRONIC SENSE OF SMELL

Although electronic devices have simulated closely the human senses of sight and hearing, the sense of smell has so far remained unique to the human nose. Perhaps the nearest approach is a device recently developed by the General Electric Laboratory of America.

IT is based on the principle that the emission of ions in air is affected by certain vapors and particles, notably those belonging to the halogen group.

In principle, a sleeve of platinum is heated to incandescence by an internal heater wire and is surrounded by a cylinder maintained at a high negative potential with respect to it.

Ions emitted from the platinum sleeve are attracted to the outer cylinder, causing a current of from 1 to 10 microamps, according to the circuit constants.

In the presence of halogen particles, the rate of flow is multiplied and conditions change in the associated circuits. The changes may be read directly on a sensitive meter or made to operate a loudspeaker through the agency of a glow discharge tube.



ULTRASONIC THICKNESS GAUGE

ON the left is illustrated a new ultrasonic thickness gauge, released in the US recently by Branson Instruments Inc.

The instrument contains a variable frequency oscillator, the output of the oscillator being itself frequency modulated by a small increment. The output voltage excites an X-cut crystal, which is placed in contact with the surface to be measured and coupled to it by a fine oil film.

STANDING WAVES

Reflections occur from the inner surface of the metal and standing waves appear at the fundamental and all harmonics of the frequency whose wavelength in the metal corresponds with the thickness. This reacts on the oscillator and the device is arranged so that an audible note is produced in the phones when resonance occurs.

The frequency range to be used depends on the nature of the material and the expected thickness, but a frequency range of from 1.4 to 2.8 Mc is suitable for steel varying from 0.125 to 12 inches. ("Electronics," January, 1948).





toadstool were often mentioned by the great poets and writers and earlier tale tellers.

Today, of course, we know better. It is our knowledge of the structure of fungus growths that has led not only to the dispelling of such fairy tales, but to a wonderful new story of the manifold uses of the once despised fungus.

Everyone, or almost everyone, likes mushrooms. The greatest objection which I hold for them is the fact that one has to get up confoundedly early to get any. Some people seem to sit up all night in the mushroom season, for whenever I have been enticed to get out of bed at unreasonably early hours of the morning to go mushroom gathering, it has always been the case that somebody has been up earlier still. What it is in the mushroom that causes responsible people to act so I do not know. Stalking cattle through wet grass three or four hours before dawn seems, on the face of it, a farcical idea. Yet thousands do it.

JOYS OF MUSHROOMING

Next to golfing, I know of no pastime which causes one to walk more miles. There is at least a little sense in golf. One does not frantically rush to and fro. But in mushrooming the whole time is spent in rushing in stages of a couple of hundred yards at a time to a white spot which looks like a mushroom in the unearthly light, only to find that it is a toadstool, a puffball, or a cigarette carton. These days I find it easier to buy mushrooms. Although the price

This early riser in Essendon, Victoria, found a perfect circle of mushrooms growing round a garden shrub, the result of one night's growth.

LIFE OF THE MUSHROOM

*"You demy-puppets, that
By moonshine do the green sour
ringlets make,
Whereof the ewe not bites; and
you, whose pastime
Is to make midnight mushrooms."
Shakespeare in "The Tempest."*

THIS verse by Shakespeare is a reminder that even in those days (1602) some notice was taken of the now much sought after mushroom. In the era of the great poet, however, fungoid growth on meadows and greens was looked on rather differently than it is today.

Tradition held that fairies, elves, goblins and the like were responsible for the sudden appearance of mushrooms and toadstools, for, during their nightly revels on the dewy

grass, the marks of their feet were to serve as places for the appearances of a toadstool which served as a resting place for tired little folk. The fact that these toadstools and mushrooms tended to form in rings lent some substance to the story, for it was widely believed that the fairies played ring-a-ringy rosy all night for some reason.

Thus it is that the mushroom and

does seem a bit high it is cheaper in the long run after taking into consideration the price of petrol, cough mixture and the time spent in extracting thousands of grass seeds from socks and trousers and the damage done to boots by the wet grass.

Now the reason for this article is to point out the importance of fungoid growths to the human being. I mention this in case you are wondering by now what I am talking about.

The word fungus conveys to many people a thought of something to be avoided, something evil and foreboding. Perhaps that is why it is as well that we refer to mushrooms as mushrooms. It sounds so much better.

Another popular idea is that most

by Calvin
Walters

fungus growths, such as toadstools and the type seen growing on fences and logs, are poisonous. This is not so. Out of the hundreds of kinds to be found, less than a dozen are in any way poisonous, and not all of these fatal in their effects.

Now don't get the idea that I am recommending you to eat anything that you find on the probability that it may be harmless. To narrow down the margin of error to such small proportions as less than a dozen would certainly make mushroom hunting much more profitable, but one still doesn't know for certain which specie one has got, so the best idea is to stick to mushrooms.

There are all sorts of "rules" for detecting edible fungus. The good are supposed to "peel" easily or do not blacken silver spoons. These tests are fallacies. There is only one test, and one has to be pretty game to try it. It is the disastrous consequences of such trial in the past that has given us the evidence which we now have, regarding the edibility or otherwise of fungoid growths.

Fungi differ very materially from the popular idea of a plant, and indeed they are more animal-like in their nature than plant-like.

PLANTS AND FUNGI

Plants have stems, leaves, roots and branches. They obtain their nutriment by means of the green coloring matter, chlorophyll, which under the action of light turns simple organic materials into the required food. They reproduce themselves by means of seeds which contain the embryo plant capable under favorable conditions of developing into a new plant.

Fungi have no specific form of stem or leaves. They are variously shaped. Chlorophyll is entirely absent, and the fungus flourishes in the dark. The food is absorbed in the complex organic form, and reproduction is not by seed but by spores, which contain no embryos but at the same time are capable of germinating and producing new fungus-growth.

The complex organic compounds which feed the fungi are already present in the plants on which the fungus feeds, or in the soil as a result of animals having eaten the plant. Thus the fungi are parasites. Having no need to perform many of the functions which characterize plants, and living as they do on the energies of their neighbors, the parasitic fungi, as also the human variety, are able to develop along simple lines.

THE MYCELIUM

Whereas plant life has a system of branches, stems and leaves to perform the functions of food-getting, the fungi have this system "below ground" as it were, in what is termed the "mycelium." This can be easily seen in the "spawn" of the mushroom which is used to grow this fungus in the home.

Throughout the brick of spawn

MUSHROOM REACHES GIANT SIZE

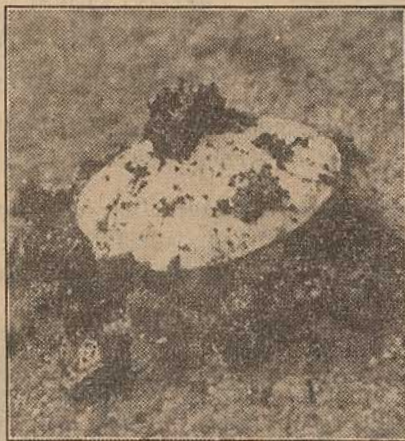


This mammoth mushroom grown at Doncaster, Victoria, measures 20 inches across the cap, 21½ inches round the top of the stalk and weighed nearly 14 pounds. Mushrooms rarely reach these dimensions!

can be seen a network of fine, branching, whitish threads. This is the mycelium or vegetative part of the growth, whose function is to absorb the food requisite for the growth of the fungus and for itself. Thus the mycelium represents the roots, stem and leaves of the fungus.

As the mycelium spreads, the threads bunch themselves together in various places and form small knots. These expand and burst through the soil to form the familiar "button" mushroom, which expands and grows into the much early morning sought after article.

This is the reproductive portion



Mushrooms, although easily damaged, will force their way through solid surfaces. This one, measuring 2½ inches across, broke through an asphalt floor in a Sydney workshop.

of the fungus which produce the spores. These spores are borne on the pinkish plate like spokes on the under surface of the white "cap." The plates are known as "gills" and are covered by the spore bearing surface or "hymenium."

THE SPORES

The spores are very numerous. It has been calculated that a single mushroom produces about 200,000,000 spores all capable of developing into a fully fledged mushroom. Judging by the number of mushrooms I have been able to collect in any cow-paddock I imagine that the eight noughts of this number fly away elsewhere.

Of course the spores must settle on some favorable ground for future development, and it is some consolation to me to state the fact that this rarely happens, and this is the real reason for the comparative scarcity.

Now what is true of the mushroom regarding its structure is also true of almost all of the larger fungi.

Fungi are among the most destructive agents with which man has to contend. They are the chief destructive agent of structural timber. The fungus responsible for dry rot in the main is *Merulius lacrymans*. This fungus causes immense damage and necessitates treatment of timber so that the moisture content is kept below 20 per cent.

FUNGI DAMAGE

The main causes of diseases in plants are fungi. These are microscopic varieties and cause rust in wheat, oats and barley. Steps have

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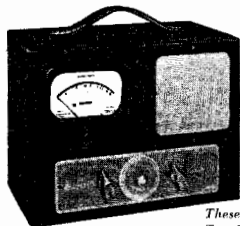
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been taken to produce immune strains of these cereals but when it is considered that there are many varieties of the fungus, the problem becomes very great. There are approximately 180 races of fungi which cause rust. Thus the problem of immunity is almost insolvable.

It seems that we will have to depend on fungicides for a long time to come.

Living trees are seriously damaged by fungi and often one sees a beautiful tree wilt overnight most probably due to attacks by the fungoid invader.

In man the fungi cause many diseases. There is the "ringworm" sometimes seen in children; the barber's itch of adults; athlete's foot; some forms of eczema; the familiar "thrush" seen in the throats of infants. These are all fungoid diseases.

ANIMALS ATTACHED

Animals likewise are attacked, and in many cases are the same fungi as attack men. Thrush, eczema, ringworm all attack animals and in addition there is the disease called actinomycosis or "lumpy jaw."

The disease called "ergotism" is caused by eating food cereals which have been attacked by the Ergot fungus *Claviceps purpurea*. There is a type of Ergot in Australia which attacks the paspalum grass. This so far as is known, does not cause any serious disability in man or animal.

Insects are favorite hosts of parasitic fungi and many of our noxious insects are destroyed in millions by such attacks. Fortunately most of these insects are pests and the loss is our gain. On the other hand, industry may suffer, as has been the case of the epidemics of the "muscardine" of silkworms caused by a fungus called *Botrytis Bassiana*.

There are an enormous number of diseases of plant, animal, man and insects which could be cited but the above is a good indication that many fungi concern mankind much more than is generally realised.

To balance the ledger somewhat many of the fungi have uses which are also not usually known.

AS MEDICINE

Although their uses as medicine are not as widespread as in earlier days some fungi still hold their place as medicaments. Among these is the *Lycopodium*, *Amanita* and several others. Perhaps the most important of all the medical fungi is the well-known *Penicillium Notatum*, from which Penicillin is made. The discovery of Penicillin has led to a revived interest in the fungus moulds as possible medical agents and quite a few new ones have been discovered. It is safe to assume that many more are waiting discovery. Thus what was once a despised object is beginning to earn respect.

Perhaps the most well-known application of the use of fungus in industry is the fermentation processes

(Continued on Page 43.)

SCIENCE NOTES—Prof. A. M. LOW

Flowers Can Think

THERE is no need to look at pictures with one's head on one side, although it might be logical not to look at them with the very centre of the eyeball. Let me explain. The millions of sensitive points which make up the retina at the back of the eye are of different kinds. Some seem so shaped as to be very sensitive to light, while others appreciate color.

You will have noticed that looking at a clock in a dimly-lit room it is better to look a few inches to one side for this brings the light-sensitive part of the eye into better play and the time is more easily seen. Color, I imagine, should be looked at straightly because it is in the middle of the eye that the majority of color cells are found.

But to return to nature; not literally. We rely upon artificial aids for most pleasures, and this is natural in an era when we try to subdue the body that our minds may improve.

Flowers turn to the sun, some catch flies, others shrivel up when touched. They are sentient. How can we be sure that they do not think and that, in fact, some are not evil? Not evil because they may be poisonous, which doubtless has a vital purpose, but nasty in their outlook. Flowers may be, I think, on an infinitesimally smaller scale, living, thinking, and instinctive parts of life. Do you experience no feeling of diffidence when you cut down a tree?



What are the Consequences?

THAT depends upon what you have done. But to be very serious, I have always wanted to write a book on consequences and platitudes. The latter are too terrible, for I listen to them all day in railway carriages and in restaurants. Why do people imagine that one wants to hear their noise any more than we would care to notice their smell?

Consequences are quite different. They are fascinating because of their



illimitable range. Might it, not be that wars are caused by a woman who loses her comb (1d combs are 1/- in London streets nowadays), annoys a man, and so on? Could not a squabble between Mr. and Mrs. Engine Driver on morning, account for an accident? Why do some seeds become weeds over long periods of rest; what, in fact, is the result of every thought we make? For thoughts do make material things in time.

Trouble With The Law

I HAVE often photographed noise with a view to proving to a hard-hearted judge that Mr. Jones was suffering from noise nuisance. It is usually accepted that if the noise of which complaint is made is greater than that which might commonly be expected from such things as traffic, then the noise is a nuisance.

Now I had a case where a man complained of a perpetual singing due to a motor, so I went into court with a buzzer making the same sound, and asked the judge how he would like to sit there all day with this half-heard sound in the air. In my view, things of that kind are very irritating.

You will remember the tale of the man at the hotel who was woken up by the resident above him throwing his boots into the corridor. He complained. The next night the offender threw out one boot, remembered his promise and carefully put the other down very gently. Three hours afterwards the man downstairs tapped on his door and said, wearily: "For heaven's sake throw out the other boot!"

The "ping" of a gnat is another troublesome sound and no one knew how it is caused. So we took a glass chamber, greased the inside so that gnats could not buzz after one landing, and then took high-speed cinema photographs. The gnat produces much of its sound as it flies by rubbing together the inner portion of its wings. A pity we do not silence aircraft, for some are so noisy as to be a menace to health and comfort.

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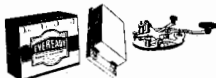


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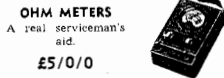
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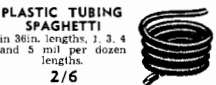
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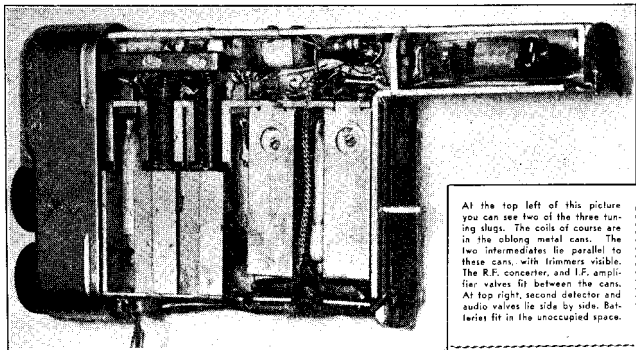
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HOW TO BUILD A REALLY SMALL SET



At the top left of this picture you can see two of the three tuning slugs. The coils of course are in the oblong metal cans. The two intermediates lie parallel to these cans, with trimmers visible. The R.F. converter, and I.F. amplifier valves fit between the cans. At top right, second detector and audio valves lie side by side. Batteries fit in the unoccupied space.

Personal receivers are no longer a novelty here. Our Australian sets are really small portables using small counterparts of larger components. This American Belmont has five valves, including an RF stage, uses permeability tuning, and operates a crystal earpiece, which fits into the ear. It's about as large as a big cigarette case.

SOME time ago, we published a picture of the tiny American "Belmont" receiver, which appealed to us as being a particularly neat little "Personal." At the time we had no details other than the one picture.

Recently, however, a friend returned from the States with one of the Belmont sets, and we have had the opportunity of inspecting it in detail.

As the above photograph shows, there is an incredible amount of material in a small space. The key to compact layout lies in the tiny valves, such as are used normally for hearing aids. They are so small that they fit in between the little coil cans and have a diameter no larger than a small pencil. They have no pins. The valve elements come through the pinch as wires. These are threaded through the holes in a "socket" and circuit-connecting leads are soldered directly to the ends. The valves can be seen in the photograph, which, incidentally, is exactly the same size as the set itself.

The extremely flat construction is possible because permeability tuning is used rather than condenser tuning. Two of the slugs may be seen in the photograph—the other is hidden behind the metal top of the case. The three slugs are mounted

on a carrier arm at the top, which is driven from the tuning knob by a small rack and pinion. The end of the arm carries a small pointer to indicate tuning on a tiny straight-line dial at the end of the case.

There is no loudspeaker. One listens by plugging a "button" into the left ear. This button contains a crystal earphone and a cleverly-

shaped plastic earpiece which locks into place as it fits the external shape of the ear.

The space for batteries is, of course, the cut-out section of the chassis. The batteries are compact, and have no great life, but then the set isn't meant to be operated day in and out.

The remaining bits and pieces are extremely small—much smaller than anything obtainable here. Wiring-up would probably be a job for an expert with a pair of tweezers and a very light iron. Valve replacement, too, doesn't look too easy, as the valves are actually soldered into the circuit.

It is, however, a most ingenious piece of work, and, although not new to the American public, is one of the cleverest pieces of space-saving design we have seen for quite a time.

NEW INVENTIONS

NEW inventions being marketed in

America:—Super walking-stick: You're strolling down the boulevard, swinging a Lukowitz cane. You come to a horse trough. You put the end of your cane in it. You press a rubber bulb in the handle. The cane sucks up a pint of cold water. Every time you come to an enemy you can point your cane, press the bulb, and squirt him. Electric irons with headlights, so the wife can iron in the dark. High "C" tomatoes, containing three times more calories than ordinary tomatoes. Pre-pedded potatoes, from which the skin has been removed with steam pressure. They're sterilized and sprayed to prevent discoloring.

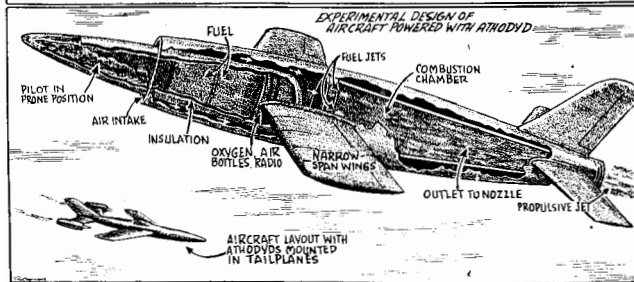
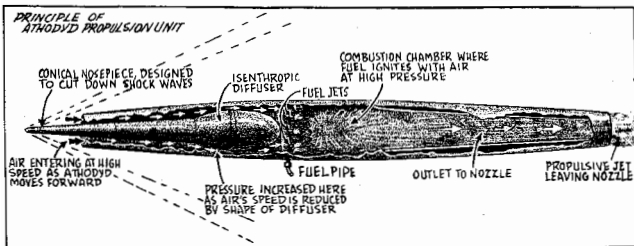


The set easily fits into one's hand.



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ATHODYD—A NEW SIMPLE RAM JET



AS the athodyd is not self-starting, it must be brought to high speed by an auxiliary power plant, either a gas turbine or rockets. It is visualized that ram jets may be used on future high-speed aircraft which fly by normal jet motors but open up the ram jets when they want to step up to, say, 1000 miles an hour.

The simplest air-breathing, jet-engine, the athodyd (Aero Thermodynamic Duct), has no moving parts. It is a neat, simple substitute for the more complicated propulsion devices, such as motor and propeller or even the gas turbine jet.

THIRTY YEARS OLD

The idea for the ram jet was first set forth more than 30 years ago by a French natural scientist named Lorin. Subsequent discoveries in the field of supersonic dynamics turned the attention of researchers to his theory, and they have found in it the fast engine of the future.

In the USA, University Applied Physics laboratories and associated

Successfully working models of a new air jet that opens up important possibilities in aircraft propulsion, have been developed. Known as the athodyd, or ram jet, it is the simplest form of prime mover in existence, and produces power by its own speed. It is designed for high speeds and in order to work it must already be travelling at great speed with air rushing through it.

Industrial organizations began experimenting with ram jets in 1944.

To work, the athodyd must already be travelling at considerable speed with air rushing through it. Just inside the athodyd's "mouth" the rushing air is slowed down, and is compressed by the still fast-moving air entering behind it, which acts like a ram.

The compressed air goes into combustion with fuel; and the hot gases expand. This expansion takes place in the nozzle-shaped after-end of the athodyd, which steps up the velocity of gases and directs them out as a jet.

Thus the athodyd drives the air out faster than it enters. By reaction, the athodyd moves forward.

Sketches here show, in diagram form, the operation of the athodyd as a prime mover and possible aircraft layouts using athodyd propulsion.

Shock waves are decreased by use of a conical nosepiece. Air entering at high velocity as a result of the speed of the athodyd, passed an isentropic diffuser, where it is slowed down, thus increasing the pressure. Fuel jets inject heavy fuel (such as paraffin), which is ignited in the combustion chamber, causing expansion and increased pressure.

The burning gas forces its way through the converging outlet to the rear nozzle, providing tremendous power.

(Continued on Page 87)



When it comes to valve replacements or valve selection, the radio owner or the radio hobbyist should indeed "Stop, try a Philips, and listen". Philips valves are designed and made to give *better listening*. Philips valves are precision built but at the same time are ruggedly constructed to assure long life under difficult conditions. Philips valves have stamina, sensitivity and the traditional Philips quality. It's full steam ahead to better listening when you fit . . .

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NEWS AND VIEWS OF THE MONTH

TELEVISION IN U.S.A.

TELEVISION'S forward surge in the last six months was made possible by more than twenty years of research and hard work in the radio industry, at a total cost of more than 50,000,000 dollars, reports our New York correspondent.

But new buyers of television receivers frequently discover that television programmes are not the well-balanced offerings of wide variety they had expected. Too many set-owners, as the complaint departments of the television broadcasters have learned, buy their instruments in the mistaken belief that video programmes are available throughout day and evening every day of the week, and that the fare includes a constant parade of top entertainers in the theatre, movie and radio worlds. This is still only a future prospect.

However, the complaints are far overshadowed by the plaudits from the rank and file of television set-owners and the members of their enthusiastic families. For the programmes, such as they are today, contain a wide enough selection of this-and-that to reach and entertain at different times individuals of both sexes and of all age groups.

PROGRAMMES

In the New York television area, video programmes can be tuned in seven evenings a week, with brief periods on a few days at noon and

again in late afternoon. Compared with sound broadcasting's schedules of 18 hours daily, the average of 22 hours weekly now attained by the three metropolitan telecasters is not impressive—except to those insiders who know the problems involved.

News commentators are appearing more frequently, usually with some newsworthy person in tow. Too often the result is not completely favorable to the one interviewed. Only a small percentage of people are videogenic, and this fact, combined with the strange and sometimes awe-some atmosphere of the television studio, often fails to bring out the best in a man.

TELEvised FILMS

Films, of course, remain the backbone of television, primarily because of their low cost as compared to the budgets of plays, remote pickups and special events. Fortunately, no one

attempts to justify such films as good entertainment. There are only so many of them in existence, and most of the better ones already have been used on the air.

As television advances and expands, the only films that are likely to be exhibited on television will be made solely for the medium. When this happens, the polite stigma which has attached itself to television's film "features" will be only a memory.

—SALES

The television sales problem of the radio manufacturing industry at the moment is not so much the finding of customers as turning out enough receivers to supply the demand. In this field, too, real progress is being made. Excellent sets are rolling off the assembly lines of big factories in large numbers. The 30,000 made in January by members

RADIO CROSSWORD PUZZLE No. 9

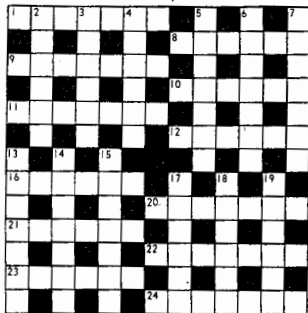
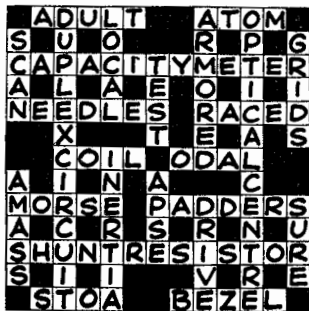
ACROSS

- Unit of magnetomotive force.
- It seals moulding powder.
- A famous R & H set.
- Type of current.
- Unit of electrical quantity.
- Make gas conductive.
- Negative ions.
- Attractive metal.
- Fuse block (two words).
- Opposes.
- Transmitter unit.
- Condensers.

DOWN

- ... antenna.
- Type of coherer.
- Flower elustr.
- ... detector.
- Style of dial.
- Relation.
- Type of coupling.
- Flexible conductor.
- Out of resonance.
- Type of detector.
- Cruel.
- Stationary plate.

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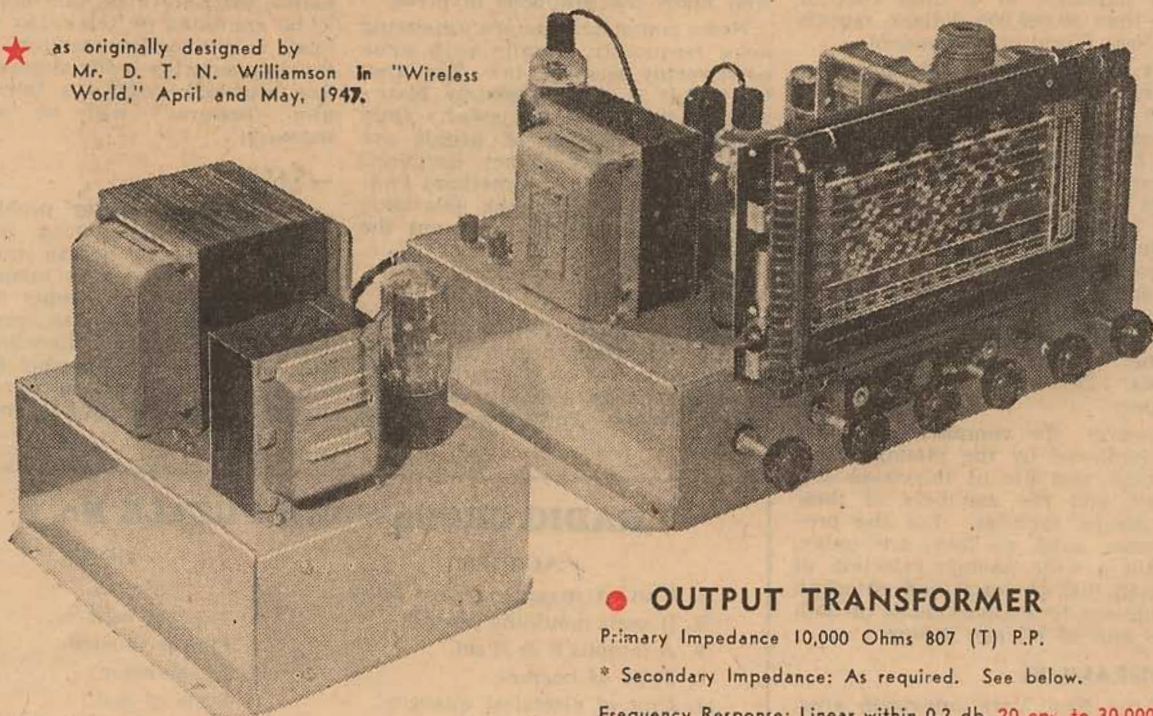


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World," April and May, 1947.



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* Secondary Impedance: As required. See below.

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1 Choke	201515	£1 11 10
1 Choke	50825	£1 7 7

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1 Choke	102512	£1 16 1
1 Choke	201515	£1 11 10
1 Choke	50825	£1 7 7

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AF10 . 500 ohm ..	Line
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of the Radio Manufacturers' Association set a new monthly record.

This latest tabulation of monthly output indicates a total of 360,000 for the year, and suggests that the industry will have to step-up its speed if it reaches the frequently-mentioned objective of 750,000 in 1948. Manufacturers who still believe they will attain the 750,000 total cite the quickened tempo which already is evident. In 1947, only about 174,000 television receivers were made and sold in the United States, and, in 1946, merely a few thousand.

—AND DISTRIBUTION

Still more millions must be spent and more work must be done before the bright images being seen today on more than 175,000 receivers can be carried across the nation by networks like those which have taken sound-broadcast programmes to every hamlet. But the present pace brings the goal of a countrywide network service within hailing distance.

There can be no question of the eager acceptance of television by a constantly increasing audience as new video broadcasting stations are built and the networks linking stations are expanded. Whenever television is taken to an additional area there is a rush to buy receiving sets.

W.I.A. CONSTITUTION

AT the Easter Convention, definite steps were taken towards the creation of a single Constitution for the Wireless Institute of Australia.

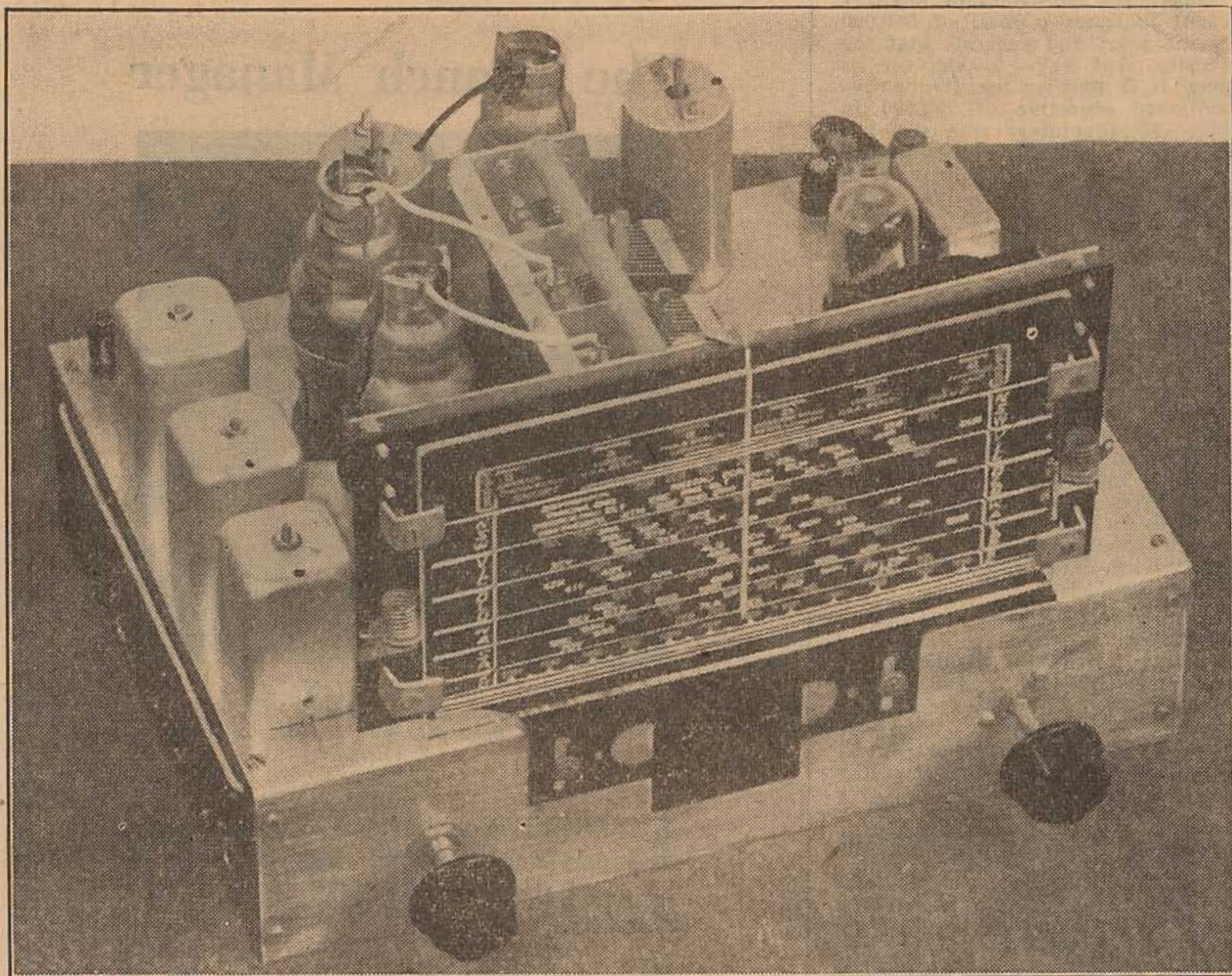
Prior to the Convention, a new document was drawn up outlining the function of Federal Council, Federal Executive, and their relation to the Divisions.

Action was confirmed concerning the framing of a Divisional Constitution which will be workable for all Divisions of the Institute, and which it is hoped will be adopted by them when it is completed. This is work long overdue, as the outdated documents now in operation cannot continue in many cases if the Divisions concerned are to carry on.

The Convention passed a motion to the effect that when this Divisional Constitution is finally decided upon, it will be considered with the existing Federal document, with a view to combining the two into a truly Federal Constitution of the Institute as a whole.

This is an inevitable step, as when one examines the position in detail, it becomes obvious that the present Federal document cannot exist and have full effect without the closest cross-reference to those which operate in the Divisions.

We hope that a conclusion of the matter will be reached during the coming year, thus forming a firm and closely-knit background against which the Institute may progress and prosper in complete unity.



The tuner is a complete unit with power supply to make it independent of any other source. This feature could be omitted if desired, and voltages taken from the amplifier with which the tuner is used.

THE R & H SUPER TUNER

This tuner—the last of the present series—is a fitting companion for the 807 triode amplifier. It covers the broadcast and short-wave bands and has a third switch position for wide-range reception of the local stations. The built-in power supply simplifies connection to the main amplifier and obviates possible trouble with hum and instability.

IT seems that we have given a great deal of attention to tuners in recent months, but, in the first instance, we set out to cover the usual types in which readers are interested—wide band TRF tuners, simple superhets, and a more elaborate high performance tuner, as featured last month.

Then, as a side issue, came the rather original scheme adopted in the "Fidelity Five" for variable selectivity. Bound up in this, it seemed, was the possibility of combining in one tuner the features required of a de-luxe installation, so that this pre-

sent circuit followed as a matter of course.

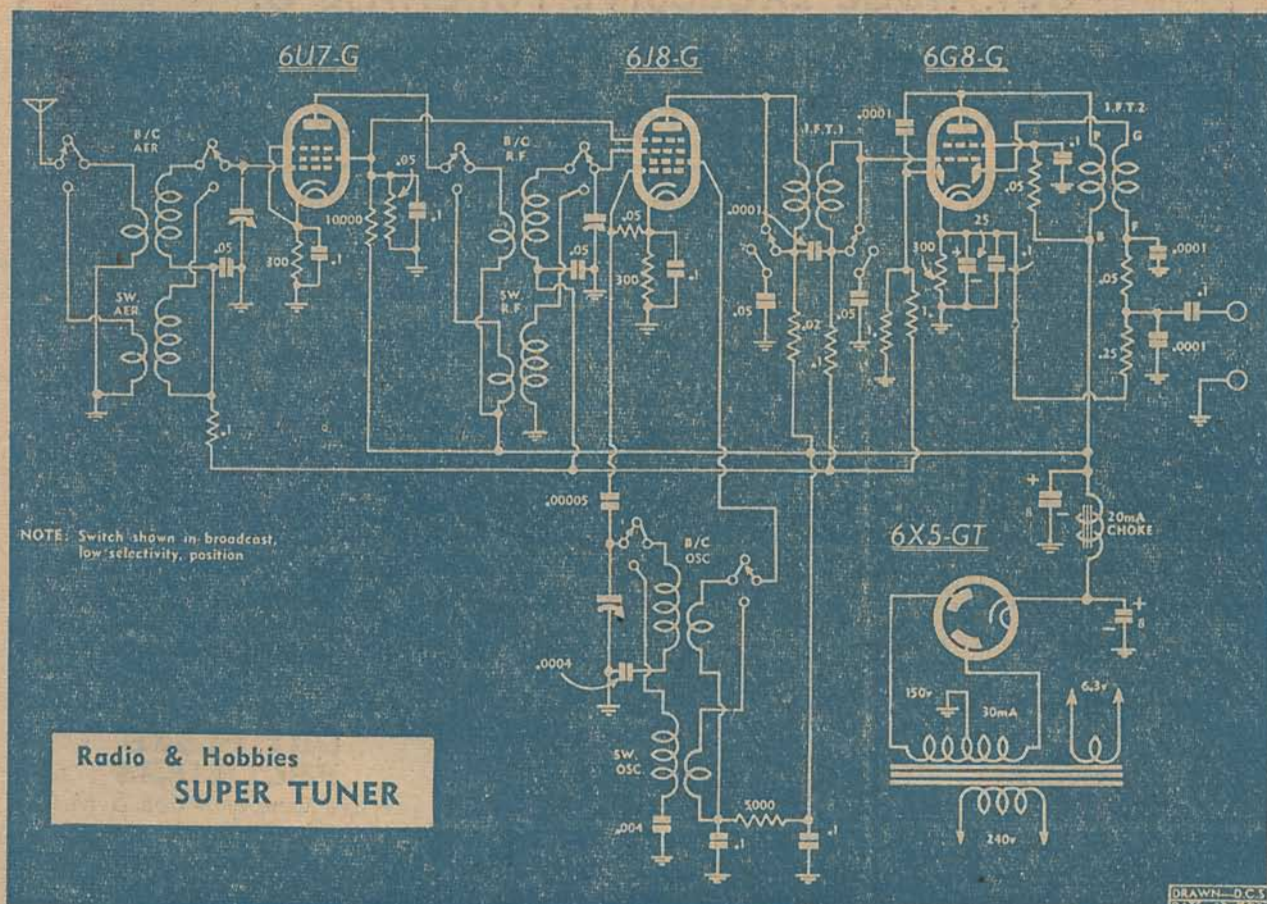
The interest shown in circuits like the 807 Amplifier and Radiogram and the TRF Radiogram, illustrates just how keen our readers are on high quality, despite the fact that a good

many pounds are involved in building up the equipment. With this thought in mind we have no doubt that this tuner will enjoy a good reception, even though it is well outside the "simple" class.

Though a good case can be made for a broad band tuner of purely "local" characteristics there is something lopsided about a de-luxe combination which will not tune interstate and overseas stations, if necessary. Commercially, such a set would have little appeal and part of the sales story behind all the big branded receivers is how many stations they will tune—even though the ultimate

by *W. N.*
Williams

CIRCUIT DIAGRAM OF THE SUPER-TUNING UNIT



The circuit includes the variable selectivity feature introduced in last month's "Fidelity Five."

owner may listen exclusively to the half-dozen locals.

We've said all this before, of course, but repetition will lay stress on the advantages of this new circuit.

Considering first straight-out station-to-station performance, a deluxe tuner must have a tuned RF stage. Operating properly, such a stage will improve the signal-to-noise ratio, will boost the gain and selectivity and, above all, reduce the risk of the stray whistles and "birdies" which so often appear in simpler superhets.

A converter valve is necessary, of course, and either one or two IF stages, according to the degree of complication permitted. A properly designed two-stage IF channel can give very good results but does not lend itself to the variable selectivity scheme we have in mind. Still, there is plenty of gain and selectivity in a good single-stage arrangement and it will tune any but the most difficult signals.

A.V.C. AND DETECTOR

Finally, AVC is more or less essential, so that a diode detector is indicated as the simplest and most satisfactory arrangement. Other forms of detection could be considered, and a low impedance output coupling stage, but the economics of the design have

to be considered, even in an ostensibly de-luxe tuner.

The same lineup of stages lends itself to good short-wave performance and, according to modern custom, at least one short-wave band is essential in a high-priced receiver. This brings up the problem, of course, of whether we should use a special dual-wave tuning unit or a switch with separately wired coils. But more of that in a moment.

Last but not least comes the feature of broadening the response curve on local stations to give higher fidelity.

Our ultimate design was built on a chassis measuring 12in. x 8½in. x 3in., which was specially prepared for the job. As usual, our own chassis was bent up from aluminium sheet, but the one you will ultimately buy will be a regular sprayed steel job.

The gang condenser mounts in the centre—the obvious position for it—with provision for a straight-line tuning dial. You can please yourself whether you use the large USL46 dial or the smaller one shown in the photographs.

Our idea was to combine the wave-

PARTS LIST

- 1 chassis 12in. x 8½in. x 3in.
- 1 dial (USL 32 or 46)
- 1 switch 4 bank double spaced. 3 x 3 or 4 x 3.
- 1 3 gang tuning condenser
- 1 power transformer 150-0-150 30 mA. and 6.3v.
- 1 30 mA. choke
- 2 I.F. transformers (455 kc.)
- Set of broadcast coils (Aerial, R.F. and Oscillator)
- Set of shortwave coils (Aerial, R.F. and Oscillator)
- 5 Trimmers (M.S.P. enclosed concentric type)

CONDENSERS

- 1 25 mfd. 40 volt
- 2 8 mfd. 525 volt
- 8 .1 mfd.
- 4 .05 mfd.
- 1 .004 mfd.
- 1 .0004 mfd.
- 4 .0001 mfd.
- 1 .00005 mfd.

RESISTORS

- 2 1.0 meg.
- 1 .25 meg.
- 2 .1 meg.
- 4 .05 meg.
- 1 .02 meg.
- 1 10,000 ohm.
- 1 5000 ohm.
- 3 300 ohm.

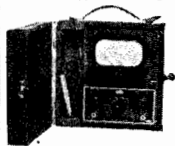
VALVES

- 1 6U7-G, 1 6J8-G, 1 6G8-G, 1 6X5-GT.

SUNDRIES

- 4 octal valve sockets, 3 valve shields,
- 4 terminals, resistor strip, shielded wire, nuts and bolts, solder lugs, hook-up wire, power flex, &c.

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24/28	375	150	50/- ea.
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12v.	230	100	40/- ea.
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change and selectivity switch, leaving the tuning control as the only other knob on the tuner chassis. To obtain a balanced appearance it becomes necessary to dismantle the dial and mount the tuning spindle separately on the front of the chassis, at the same time lengthening and re-threading the cord.

Alternatively, you may prefer to install a rotary toggle switch in the mains circuit, allowing the tuner to be switched on and off and providing three balanced controls on the front panel. These are minor physical features about which the individual constructor can please himself.

From the design point of view the chief point of interest is in the installation of the wavechange and selectivity switch and the method of mounting is seen in the underneath photograph.

THE SWITCH

The switch will normally not be available in the exact form required, and we had to visit a couple of supply houses to obtain the necessary wafers, spacers, spindle and threaded rod.

Four wafers are necessary, and these should be three-position types with either three or four poles per wafer. The locating plate therefore needs to be of the three-position type with a tongue at least 7in. long. Six 2in. spacers are necessary and two threaded rods at least 8½in. long.

When the switch is assembled, you will have just on 2in of threaded rod behind the rear bank, and this can be pushed through appropriate holes in the rear of the chassis and locked in position with nuts on either side. The front, of course, locks normally in the mounting slot, so that the switch is supported positively at each end.

The front section of the switch serves the aerial coil and the grid circuit of the RF amplifier valve. The second section switches the RF coil, while the third section selects the oscillator circuit.

With this layout, the broadcast coils mount quite conveniently along the upper edge of the chassis, with the short-wave coils are beneath the chassis and vertically below them.

LAYOUT

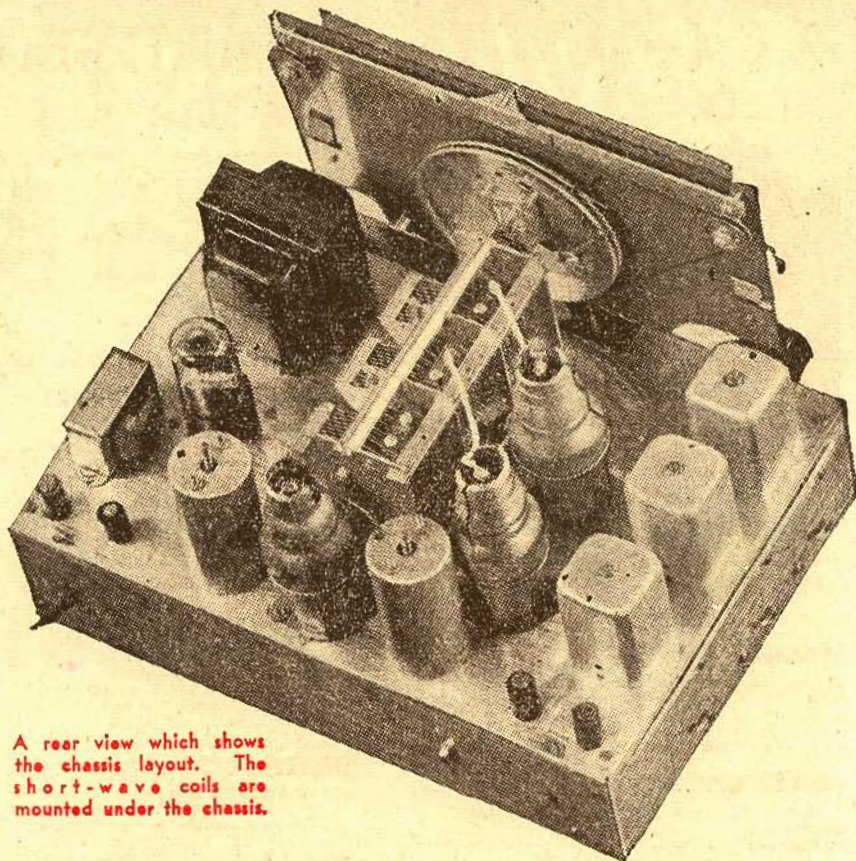
The RF amplifier socket is located between the second and third banks, with the converter socket behind it.

This arrangement brings the first IF transformer very conveniently near the rear switch wafer, so that the variable selectivity leads are quite short. The leads are also well away from the IF amplifier plate wiring, so that the chances of instability are remote.

The separate power supply occupies the remaining portion of the chassis as a matter of course.

The only obvious alternative to this general arrangement would have been to use a regular commercial dual-wave unit, available on the market in two or three brands. However, it would have been necessary to install separate switching for the broad band characteristic, and the net result, apart from the extra cost, would have been less convenient. Nevertheless, if you have any strong

REAR VIEW OF SUPER-TUNER



A rear view which shows the chassis layout. The short-wave coils are mounted under the chassis.

ideas on this point, there is no reason why the circuit and layout should not be adapted to suit a commercial tuning unit.

The electrical circuit follows along the same lines as the superhet. tuner featured last month. There is the RF amplifier stage, converter and IF amplifier, with diode detector. Each valve has its own cathode bias circuit and a network of resistors supplies the respective screens. AVC is applied to all three grids on the broadcast band and to the RF and IF stages on short waves.

The power supply is also exactly the same as last month, using a 150 volt 30 mA. transformer, as originally designed for our "Minivox" receiver. The tuner will not normally draw more than 15-50 milliamperes, under which conditions a high tension voltage of about 180 is available for the plates.

HIGH TENSION VOLTAGE

This is a little lower than normal, but there is the immediate advantage that risk of condenser breakdown is small. The effect on results of the reduced voltage is quite unimportant, since the screen and oscillator feed resistors have been arranged to apply normal voltages to these electrodes. A check on valve characteristics reveals that transconductance — on which stage gain depends — is not much affected by reduced plate voltage, provided the other operating potentials are maintained.

We have assumed that this tuner will normally have its own power

supply, so that the resistor valves have been fixed accordingly. If you choose to operate it from the amplifier supply, or otherwise boost the high tension voltage to around 250 volts, make sure to increase the oscillator anode feed to 20,000 ohms, the 10,000 ohm screen resistor to 25,000 ohms and the 6G8-G screen feed to 0.7 megohm.

For rather obvious reasons we have not attempted to draw a wiring diagram for the tuner, but the schematic circuit shows the band switching in detail. The switch is shown in the broadcast "broad" position. The centre position is straight broadcast and the third position "short wave."

As in the "Fidelity Five" receiver, the broad band characteristic is achieved by switching out the windings of the first IF transformer and operating the receiver with resistance coupling between the converter and the IF amplifier grid. A very desirable result is therefore obtained with standard components, an extra switch bank and a couple of wiring parts.

BROAD BAND RESULTS

The difference this makes in quality is very marked, at least in those transmissions which are not subjected in the studio to treble cut-off. The overall response is somewhat sharper than an ordinary TRF tuner, although regenerative effects in the latter can wreck the shape of the selectivity curve.

If, in practice, it is found that

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Extra coil unit for 3/- (When ordering state frequency you require).

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BC/352 & BC/191W. 24 volt and 12 volt Transmitters respectively. These units use one number 10 tube as speech amplifier, one number 211 as Master Oscillator, one number 211 as power amplifier, and two number 211 as Modulators. An excellent transmitter for the amateur. Can be supplied with tuning unit. Types 8200-7109kc. Price for transmitter and one unit, less power pack. £16
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HC/457A. Transmitter. Uses 3/1625 tubes, 1/VT137 and VT138, includes a crystal. Obtainable in various frequencies from 2 to 9 mc/s. Our Price 25

AMERICAN RECEIVERS

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BC/133/D. Receiver. Frequency 108 to 119.2 mc/s. This is a 10 tube receiver using 3-717A, 6AK5 Valves, 1-12AH7, 1-12A6, 2-12BH7, 2-12SG7, 1-12SQ7, and each receiver is equipped with 2 crystals (freq. of crystals between 5655 and 5722kc.). Price with 24 volt generator, £8/10/-; Price less 24 volt generator, £7/10/-.

BC/357/P. Receiver. Frequency 75 mc/s. Two valves type, VT133 and 12SQ7. Employs two tuned circuits and an excellent relay. Circuit supplied with each set. Price, £2.

BC/454B. Receiver. Available in frequencies 2 to 6 mc/s and 2 to 9 mc/s. Six valves, 1/12A6, 3/12SK7, 1/12SK7, 1/12K8. With 24 volt generator, £7; less 24 volt generator, £6.

AMERICAN RECEIVERS

BC/AO329. Receiver. Uses 5/29 valves and 1/37 valve, plug in coils. Covers a large frequency range. Power pack not supplied. Price with one coil unit, £5; Extra coil units, 3/- each. (State the frequency you require).



VALVES

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866A-Mercury Vapour Rectifier £1/7/3	
884-Gas Triode	£1/11/11
8F50-RF Pentode	17/3
EA50-Diode	14/-
227A 100W. Triode	£1/5/-
5HP1-Sin. Cathode Ray Tube £2/1/3	
2X2-High Voltage Ray Tube	16/8
68H7-HF Amp. Pentode	19/6
6H6-Midget Metal Twin Diode	17/3
7193-VHF Triode	£1
6AC7/1852-Television Pentode	17/3
6AG5-RF Amplifier Pentode	£1/4/6

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the selectivity is higher than necessary for your particular district, it would be possible to wire the unused switch sections to load the signal tuned circuits on the broad position. We did not actually try this, but the possibility is mentioned as a matter of interest.

Actually, the tuner came right up to expectations in its original form. On the sharp position it brought in the usual array of signals, the AVC action being so good that it was difficult at times to tell when one was tuning from a local to a distant station. The tone, of course, tended to be "mellow," due to side-band cutting.

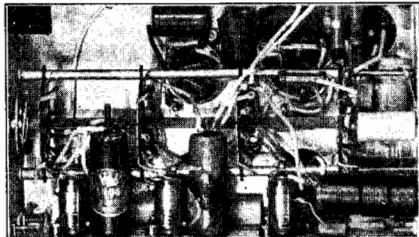
EFFECT ON VOLUME

Switching to the broad position made an immediate and amazing difference to the treble response, without much apparent effect on the volume. The presence of the RF stage and operation of the AVC in

mons. Check roughly on the fitting of the dial and cord but do not actually mount it in position until the rest of the constructional work is complete.

Next mount the broadcast coils in position, the valve sockets, IF transformers, power transformer and filter choke. You can then proceed to complete the power supply wiring and to put in the heater leads, B-plus wiring, screen supplies, and so on.

In fact, at this stage, it is possible to install the whole of the wiring from the plate circuit of the IF amplifier onwards, together with other parts which are not likely to be in the road of the switch wiring. It is a very simple matter to slip the switch into position now and again to make sure that you are not stacking components where the switch assembly is likely to fall. You will find it helpful to mount some of the resistors on a panel just in front of the IF amplifier socket.



This picture shows the short-wave coils and trimmers mounted on the side of the chassis immediately below the broadcast coils. The wavechange switch is also visible.

this tuner maintains a much more constant volume level than was possible in the "Fidelity Five" receiver. In fact, on this tuner we were able to enjoy some excellent programmes on the broad position from the stronger interstate and regional transmitters.

The value of the broader response depends almost entirely on the nature of the programme. On direct broadcasts, transcriptions and good recordings, the added realism is quite evident. On bad recordings, it will enable you to hear only the added scratch and distortion—a rather dubious privilege. Lastly, you will notice little or no difference if the station is using a low pass filter on its recordings or if the tone control on your amplifier has inadvertently been left on the treble-cut position.

CONSTRUCTIONAL

Now for a few pointers on construction: Mount the tuning gang for preference with the stators adjacent to the valves, to ensure short leads. The grid leads for the RF and converter valves come off the front and middle stators, while leads pass from all three stators down through the chassis to the appropriate switch sec-

The aerial, earth and output terminals are mounted at the rear of the chassis, mainly because they are readily accessible in this position. The output terminals can be connected to the appropriate wiring by a short length of shielded wire, another length connecting the tuner output externally to the amplifier input. It is just as well to keep these leads as short as possible to minimise chance of treble loss due to their capacitance.

Some instability might occur if the actual lead wire were carried across to the aerial terminal underneath the chassis. To avoid this risk we adopted the old scheme of bringing the wire out through a hole in the end of the chassis, along the outside and then hack in again through another hole near the front switch water.

TRIMMERS

You can please yourself about the type of trimmers used, but the chassis is drilled for a particular type which mounts by two bolts and gives ready access from outside to the adjusting screw. Six trimmers are required, one for each coil.

In wiring the coils, trimmers and switch, some care is necessary with the sequence of operations. The

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RADIO MART

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MA2351

broadcast coils will be installed first, together with the AVC bypass condensers, the padder and the associated wiring. One side of each trimmer will automatically be earthed, the insulated lug being connected to the "grid" lug on the respective coils. Loose leads should be attached to the aerial grid and plate lugs of the respective coils for subsequent connection to the switch.

Next install the switch and connect it as indicated to the gang, the broadcast coils and the aerial lead in, as indicated in the circuit. The rear bank must be interconnected with the last IF transformer.

SWITCH POSITIONS

In the original tuner the counter-clockwise position of the switch was for broadcast "broad," with the centre position for broadcast "sharp." The two sets of contacts will therefore be paralleled on all sections of the switch except the rear one. On this, the counter-clockwise position shorts the IF transformer, but returns it to circuit for the broadcast "sharp" and the short-wave positions.

One has to think carefully in wiring up a switch of this nature, but the battle is half over if you work out beforehand what the switch is supposed to accomplish on the respective positions and proceed to wire it accordingly.

It is helpful to leave the switch normally in one position at a time, so that you can observe the contact shoes and note which lugs are actually in circuit. Our schematic diagram is drawn with the switch in the broadcast broad position.

SHORT-WAVE COILS

The short-wave coils and trimmers go in last, since they are above the switch. When you see the wiring completed you will appreciate the difficulty of adding a forgotten lead on any one of the broadcast coils.

The alignment procedure is quite standard for a dual-wave tuner. Align the tuner in the broadcast sharp position and forget for the time being that it has a broad position. Similarly for short waves. If you are not familiar with the alignment procedure we can supply the reprint of a general article on the subject through the shilling query service.

When the alignment is complete you can switch to the broad position and note the difference in results. The tuner can be used normally in either position, but when changing from broad to sharp do not forget to re-check the tuning. And if you try out the scheme do not forget to write and let us know the results you have obtained from it.

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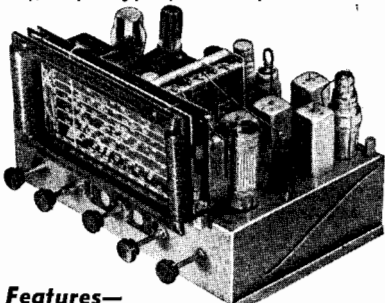
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- Modern circuit using 1948 latest valves.

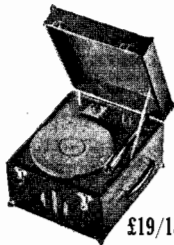
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45 Watt Super Power P.A. Amplifier

Designed specially for large outdoor gatherings and factories. Will operate at least six horn type P.A. speakers, or twelve 8" speakers. In addition to high power, the fidelity of this unit for music is extremely high. [Appearance as illustrated.]

20 WATT ALL PURPOSE FIDELITY AMPLIFIER

This amplifier originally designed for high fidelity has also proved most popular for P.A. work, such as, outdoor meetings, dances, etc. Will safely handle three horn type P.A. Speakers, or at least six 8" speakers. [Appearance as illustrated].

15 WATT ULTRA HIGH FIDELITY AMPLIFIER

For its low cost this, to our knowledge, is the finest high fidelity unit ever produced. Employing push-pull triodes this amplifier is virtually distortion free. Music-lovers will hail it as the amplifier of their dreams. [Appearance as illustrated].

12 WATT "VOX MAJOR" AMPLIFIER

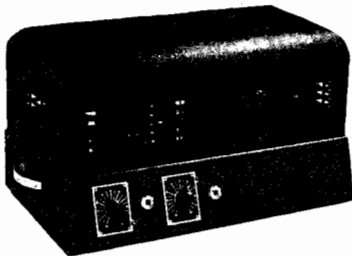
Originally described by "R. & H.", this amplifier combines compactness and economy with adequate power output. Primarily designed for record reproduction in the home or in a small hall.

10 WATT GENERAL PURPOSE AMPLIFIER

Although suitable for small outdoor functions this amplifier was designed primarily for indoor P.A. work. For those who require an efficient, medium power, low cost amplifier, this 10 watt is the answer. [Appearance as illustrated].

Circuits and building hints supplied with all kits.

Prices available upon request.



4-5 WATT "VOX MINOR" AMPLIFIER

Originally described by "R. & H.", the "Vox Minor" is the ideal small amplifier for record reproduction in the home. It is an excellent unit for the experimenter, particularly in view of its very low cost.

13.5 WATT P.A. VIBRATOR AMPLIFIER

For the country man, or in locations where A.C. power is not available, this 13.5 watt is the answer. Operates from 12 volt batteries, and is suitable for quite large outdoor functions. [Appearance as illustrated].

4 WATT "VIBRAVOX" VIBRATOR AMPLIFIER

Another "R. & H." design, this small unit is ideal for the country man where home record reproduction is desired. Also highly suitable for amplifying small halls. Fidelity is equally as high as A.C. units of equivalent power output.

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MORE DATA FOR GERMANIUM DIODE

The germanium crystal diode, a new development, is a tiny electronic component which makes use of the anomalous properties of a so-called "semi-conductor," performs many of the functions of the more complicated vacuum tube, and is particularly useful at very high frequencies.

A FAMILIAR relic of the early days of radio is the crystal detector which made use of the unidirectional flow of electric current across the contact between a wire point, popularly called a "cat's whisker," and the surface of a galena crystal. This type of detector was displaced 25 years ago by the thermionic vacuum tube, which completely revolutionized radio.

U.H.F. RECTIFIERS

Within recent years, the extension of radio communication to ultra-high frequencies (1000 to 10,000 megacycles) has revived interest in rectifiers of the point-to-plane type because of the difficulty of making vacuum tubes small enough to function efficiently as rectifiers, even when the electrodes are spaced only a few thousandths of an inch apart.

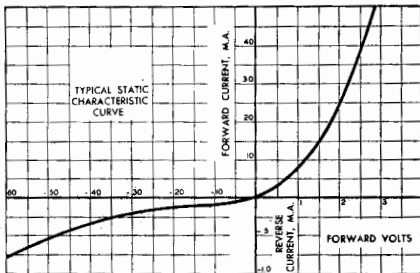
The so-called "transit time" of electron flow from cathode to anode is too long in this new band of high frequencies. This consideration led to the use of solid-contact rectifiers in which the spacing between electrodes and the consequent transit time are negligibly small even at the highest attainable frequencies.

From the electrical point of view, materials are generally classified as conductors, non-conductors, or insulators, although all substances conduct electricity to some extent. Metals, which are the best conductors, have conductivities as much as 10 to the power 20 times those of the common insulators.

SEMI-CONDUCTORS

There exists a small group of substances characterized by the possession of electrical properties intermediate between those of metals and insulators. For instance, germanium and silicon, although resembling the metals in appearance and general properties, have about one million times the electrical resistance of copper; on the other hand, they are several million times as conducting as ordinary insulators.

These intermediates are called "semiconductors" and, in the pure state, are considered to be deficient in the number of free electrons that can move from atom to atom in the crystalline lattice. It has been found, however, that if small



Showing rectifying characteristics of germanium diode. Note different scales used for reverse and forward reading.

One of the most "romantic" technicalities which came out of wartime U.H.F. research was the application of the humble crystal detector to microwave radar equipment. The development of the modern germanium crystal and its applications are explained in this article by engineers of the General Electric Company, America.

amounts of properly selected impurities are added to one of these semiconductors, the number of free, or conduction, electrons can be increased and the resistivity of the material can be lowered to an extent that brings it very close to the range of values characteristic of pure metallic elements.

In this respect, semiconductors

are sensitive in an extraordinary degree to the presence of added impurities, or "donors"; for example, germanium with a resistivity of 10 ohm-cm has its resistivity lowered to 10-4 ohm-centimeters by the addition of approximately one atom of antimony to 5000 atoms of germanium.

EFFECT OF IMPURITIES

This property illustrates one of several anomalous characteristics of semiconductors as compared with metals, namely, that the addition of an impurity increases the conductivity, whereas increased conductivity of metals has been found to result from increased purification. Another interesting characteristic of semiconductors is a negative temperature coefficient of resistance, evidenced by decreasing values of resistivity with increasing temperature.

Use has been made of the anomalous electrical properties of germanium in the development of a new rectifier of the point-to-plane type. A small piece of germanium, suitably prepared and optically polished, is supported inside a short section of quarter-inch metal tubing. The pointed end of a fine platinum wire, insulated from the tubing, is brought into contact with the germanium and welded to the surface.



The diode itself is quite small.

A Special Selection of Disposals Bargains for June

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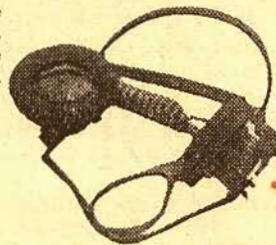


Mfg: by Shure Bros. for U.S. Army Signal Corps. This unit consists of two carbon microphone elements fitted to rubber neck piece, 11in. rubber cord with plug and elastic neck band. Operating current less than 100 M/A.

7/6
Postage 6d.

DYNAMIC PHONES

Complete with adjustable head band and rubber cord. Each earpiece is a genuine permag. dynamic unit with 1 1/2in. dia. cone. The impedance is 45 ohms each.



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An American unit with standard phone plug and jack fittings. Enables low impedance phones to be used on ordinary

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A useful switch for many purposes. There are 3 banks and each is a 4-pole 2-position, making 12 circuit 2-way switch.

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A projection type switch board meter. 2 1/2in. dia. One range only 0-150 M/A. A genuine bargain as you cannot buy better than Ferranti.

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Single earphones unit mfg. for British Navy. 300 ohms. impedance. Fully enclosed construction. These units do not include a band or cord.

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NAVY MAGNETIC MICROPHONE



Diaphragm operated type incorporating ON-OFF switch. Fitted with 11in. cord and plug.

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Black G.R. type instrument knobs 1 1/8 dia. for 1/4" spindle ----- **6d.**

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Respirator Carbon Microphones ----- **2/6**

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400 ohm. PMG type relays ----- **5/-**

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Bands for single head-phone ----- **6d.**

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Telephone Relay Panels ----- **2/-**

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Thermo Ampmeters 0/300 mA or 0/1 Amp. ----- **10/-**

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Coil former for crystal sets. Approx. 3 1/4" dial 4" long **6d**

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MAGNETIC UNITS

A balanced armature unit with corrugated metal diaphragm. Very sensitive. They can be used as microphones, earphones or small speakers. Low resistance.



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6MF. CONDENSERS

Large capacity condensers ideal for amplifiers and small transmitter. Test voltage 2000. Safe operating voltage at least 750. Size 5in. x 4in. x 1 1/2in.

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Stocks of these well-known sockets are now getting low and 5-PIN TYPE is the only one available.

2/-, Postage 3d.

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P.M.G. 3000 type with 1000 plus 500 ohm coil and 3 sets closed contacts. Also limited stock. 2000 type with 250 ohm coil.

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H.D. RESISTORS



Vitriuous Enamel type resistor with brass end caps. Size 5 1/2in. x 1in. dia. 5000 ohms. 55 watts.

1/6, Postage 6d.

The above lines except those in centre panel are brand new and fully guaranteed.

PRICE'S RADIO

5 & 6 ANGEL PLACE, SYDNEY.

This junction exhibits a ready susceptibility to the flow of electrons from the germanium crystal to the platinum wire, but offers a high resistance to electron flow in the opposite direction. Regarded as a negative-particle diode, the device possesses uni-directional properties similar to those of the vacuum-type detector tube. For example, when the platinum is made the anode with an applied potential of about plus 1 volt with respect to the germanium cathode, the resistance of the junction is about one hundred ohms; whereas, when the voltage is reversed (making the platinum the cathode at minus 1 volt), the resistance is of the order of a million ohms. The reverse voltage may be increased to as much as minus 100 volts in some cases without producing excessive current.

This property of the metal-semiconductor junction of withstanding high inverse voltages is attributed to the presence of a boundary layer inside but near the surface of the semiconductor of a thickness (depending on the nature and number of donor atoms present), estimated 10 to the 6th power cm. When such a barrier supports a potential of 100 volts, a gradient of one hundred million volts per centimeter is indicated. Also, when a current of 10 milliamperes passes through the area of contact (approximately 10-8 square inches), a current density of the order of one million amperes per square inch may be attained. Because of this small area, the inter-electrode capacity at the contact is extremely small, a feature that makes this type of rectifier applicable for ultra-high frequencies as well as for intermediate and commercial frequencies.

HIGH VOLTAGE

Although original interest in the device centred about its use as a high-sensitivity, low-loss detector at microwave frequencies, it was discovered that the unit could withstand very high voltage pulses without damage. This property led to its adaptation to high-voltage regulation. When tested as a rectifier in a single-phase, half-wave circuit, these units are still operating without failure after 5000 hours, while delivering 50 milliamperes d-c and supporting a peak inverse voltage of 80 volts.

They can be adapted to such uses as voltage regulators and low-frequency oscillators, as well as detectors and rectifiers. As developed in the Research Laboratory, these crystals have much greater uniformity than the old-fashioned type of contact rectifier, and it is not necessary to seek for a sensitive area. Because the germanium functions as a unipotential cold cathode, the heater supply customarily used with hot-cathode diodes is eliminated and consequently there is no a-c hum or problem of insulation. In addition, the small weight and size (about the same as a quarter-watt resistor), make the germanium diode suitable for use in portable electrical equipment.

Homecrafts

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Last Chance to obtain the Famous 5BP1 Cathode Ray Tube. Originally cost £16. Available at 37/6, plus Sales Tax. Circuit Diagram to build De Luxe Cathode Ray Oscillograph. 1/8 5BP1 Sockets, 3/6. Limited quantity only.



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Miniature Sockets. Moulded Bakelite Sockets. As illustrated. With perfect contacts. Price 11d.



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AT LAST! A Crystal Set with real Selectivity and Power. The Capitol De Luxe Crystal Set, as illustrated, in Polished Wooden Cabinet. Complete with Brown's English Headphones. Only £2/17/6.



Hammerlund Ceramic Type Trimmer Condensers. 3 to 30 mmfd. As illustrated. 1/-.



Type EF90 High Gain RF Pentode. As illustrated, 16/-. Just Arrived—English 9-Pin Ceramic Sockets, 2/- To suit EF50.

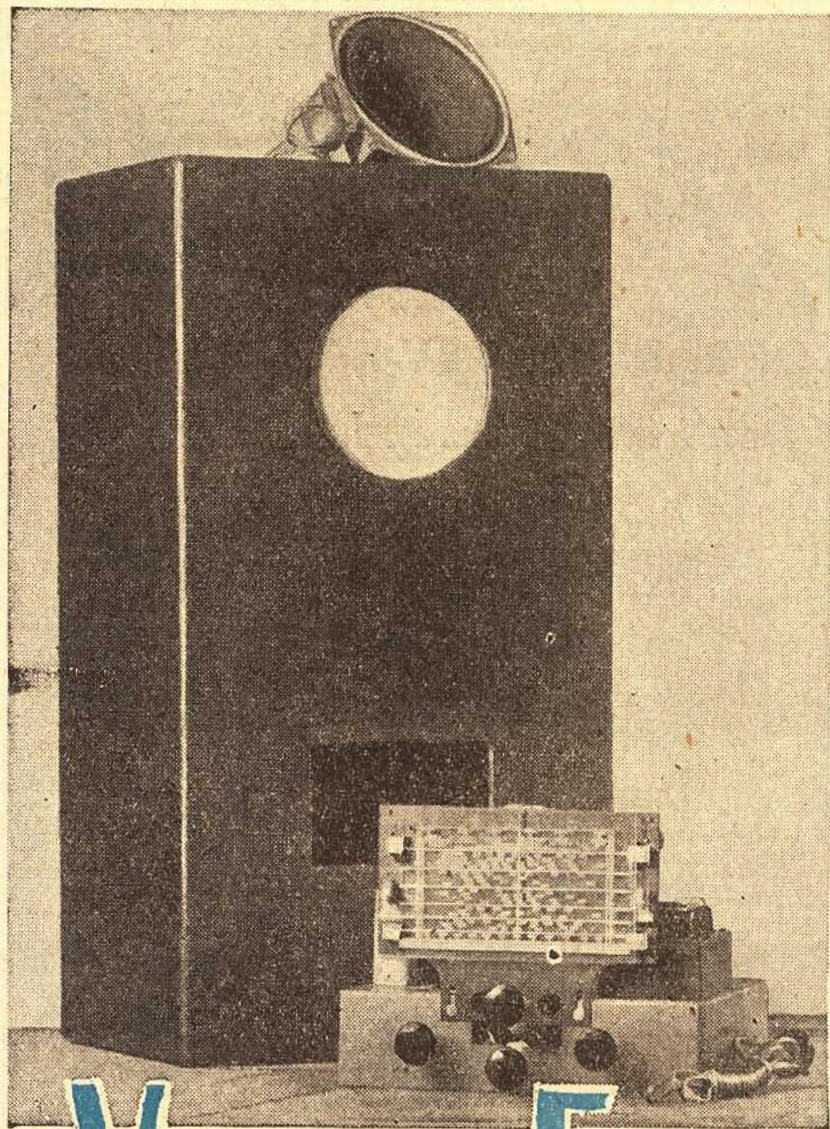
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100 watt Electric Soldering Irons, Cut to 17/11.
Disposal STC Headphones. 50 ohm. Cut to 8/11.

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Our experimental vented enclosure for a 7 or 8-inch loud speaker. Recommended dimensions are given elsewhere.

are constructed chiefly of medium-weight plywood and the whole structure may exhibit resonant tendencies in the region of 100 to 300 c/s. Furthermore, if the cabinet is placed close to a wall, the particular volume of air so enclosed may itself have resonant properties.

RANDOM RELATION

These factors, together with the natural cone resonance of the speaker, are often in random relationship and, in the worst case, can transform the low frequency output into a series of single frequency thumps. In other cases, the result may be less objectionable, but the point can at least be made that any conventional cabinet must be very heavily constructed for best results, preferably lined with sound absorbent material and located in the room, or at a distance from the wall, such that optimum results are obtained.

But, even allowing for careful construction and placement, the ordinary open-backed radio cabinet cannot be regarded as a completely satisfactory baffling device for the loudspeaker.

Yet another method is to mount the loudspeaker in a dividing wall, which must itself be free from structural rattles and resonant effects. In passing, it may be observed that panelled partitions have very serious shortcomings in this respect.

By mounting a speaker in a wall,

Vented Enclosures

THE need for adequate speaker baffling is well known and readers interested in fidelity will not need to be convinced on this point. The real problem lies in the choice of the most suitable method.

The simplest scheme is to mount the speaker on a flat baffle board which should be of at least 3-inch timber and as large as possible. Braces must be screwed across the back of the board if there is any tendency for it to cause "drumming" effects.

Fair results can be had from a flat baffle if it can be made upwards of four feet square and located for preference on a heavy carpet across one corner of the room. However, a marked loss at the very low frequencies is inevitable with conventional loudspeakers and any feasible size of baffle.

Recent attention given to fidelity amplifiers and receivers has brought to light many requests from readers for information on loudspeaker baffling: This article deals mainly with the vented enclosure type and a new simplified method is presented for calculating dimensions.

The ordinary radio cabinet operates more or less as a baffle board effectively somewhat larger than its frontal area by virtue of the sides and top. However, its construction may produce more complicated characteristics. Many radio cabinets

or alternatively across the opening of a disused chimney, complete segregation is achieved of the front and back radiation and the baffling effect is far better than offered by a simple baffle board or radio cabinet. However, few amplifier enthusiasts are likely to have chimneys or walls available for this purpose, and a method of baffling has to be chosen more commensurate with domestic requirements and furnishings.

Excellent baffling can be obtained in a relatively small space by either of two methods—the folded horn or the vented enclosure.

Externally, a folded horn looks not

by *W. N. Williams*

unlike an upright console cabinet with a loudspeaker hole near the top and a much larger grille at the bottom. The space inside the cabinet is occupied by a complicated system of shelves and partitions which provide an air column between the rear of the speaker cone and the lower grille, of constantly increasing cross-section. Frequencies below about 200 c/s traverse this column and are coupled to the air in the room via the large opening at the end. Higher frequencies fail to traverse the complicated column path and are heard instead by direct radiation from the cone.

HORN DESIGN

Successful operation of a folded horn system demands that the cross section of the throat, the rate of expansion, the length of the air column and the area of the large end conform to definite design requirements. Since the area of the throat is directly related to the area of the cone, loudspeakers larger than 8in. diameter are seldom used with this system—at least for domestic or audition-room purposes. A folded horn for a 12in. speaker would be prohibitively large.

It is generally agreed that the construction of a folded horn baffle is rather outside the resources of a home workshop, especially nowadays when heavy plywood is so difficult to obtain. Actually some information on the subject was given in the February and June 1940 issues, but lack of space and limited usefulness of the drawings does not permit their being reprinted here.

On the other hand, the vented enclosure is relatively simple, being no more than a box of a specific volume, constructed of heavy timber and provided with a loudspeaker opening and a vent. Information on the subject was given in the October 1943 issue, but subsequent work and investigation has shed new light on the problem.

One of the requirements of a baffling system is that it should load the loudspeaker effectively at all frequencies, particularly at the resonant frequency of the loudspeaker cone. This may occur at anything from about 55 to 110 c/s, depending on the nature of the speaker.

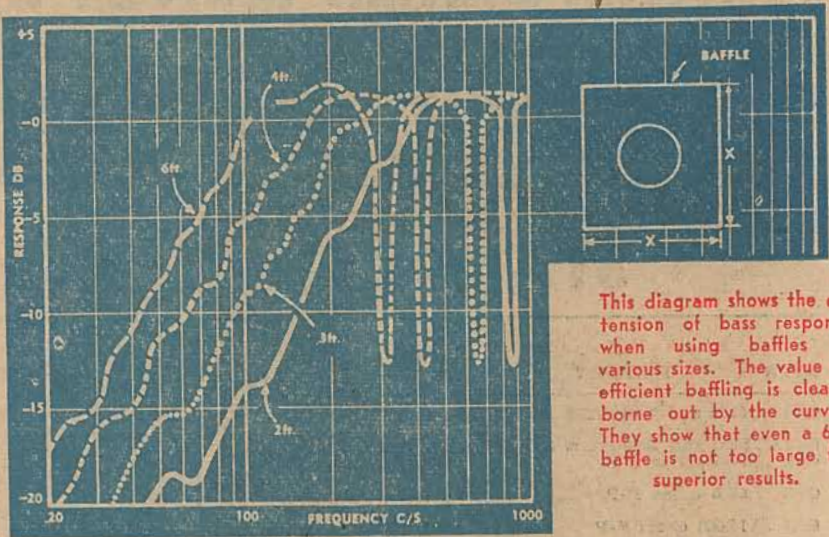
RESONANCE

The cone resonance is evident as a sharp rise in output at a particular frequency when the input signal is swept across the bass register.

The resonance can be damped out electrically to some extent by making sure that the associated amplifier has the lowest possible output impedance—either by the use of triodes or by voltage negative feed back, or both.

As originally suggested, the idea of the vented enclosure was to "tune" the cabinet resonance to the loudspeaker cone resonance by careful control of the volume and the vent area. This resulted in the single cone resonance peak being replaced by two peaks of much lower amplitude and displaced to either side of the original

LOUD SPEAKER PERFORMANCE



This diagram shows the extension of bass response when using baffles of various sizes. The value of efficient baffling is clearly borne out by the curves. They show that even a 6ft. baffle is not too large for superior results.

one. Below this the response tapers off.

There is no doubt that this scheme works out very nicely with a 12-inch speaker—or larger—which can be expected to have a natural cone resonance in the vicinity of 60 c/s. Impedance and output curves taken under ideal conditions give a most attractive result.

From the home constructor's point of view, however, it is very difficult, if not impossible, to arrive at the optimum condition. The basic formula, as given in the October, 1943, issue, is simple enough, but the constructor must accept the approximation for the cone resonance and must ignore the effect of the speaker itself inside the cabinet and the compliance of the material of which the cabinet is constructed.

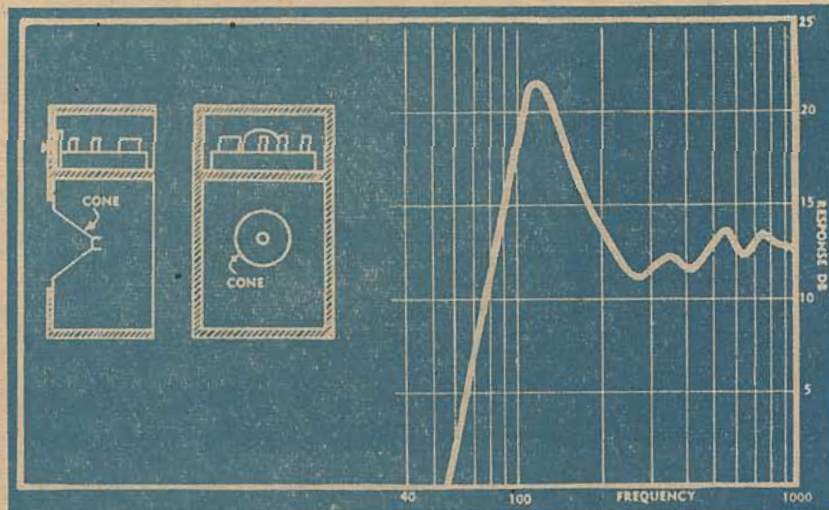
GENEROUS SIZE

Another difficulty lies in the fact that the application of the formula for smaller loudspeakers gives a cabinet of relatively small dimensions

and, while the resonance cancellation may operate, it occurs at a very much higher frequency and the bass cut-off is more noticeable.

It would appear preferable in this case to allow the cabinet size to err on the side of generosity so that the cabinet volume and resonance, instead of directly cancelling cone resonance, simply extends the bass response down to a much lower figure. It will still provide a certain amount of acoustic damping on the movement of the cone, and this can be further enhanced by electrical damping from the amplifier. At the same time it would appear undesirable to use an excessively large vented enclosure with a small speaker, since there would be a large frequency gap between the cone and enclosure resonance.

It is fully realised that these statements are generalisations, but actual experiment has indicated that enclosure area is not as critical under ordinary listening conditions as might be imagined.



The response curve of a typical combination of loudspeaker and open-backed console radio cabinet. Note the prominent resonance near 100 c/s and the sharp cut-off.

TRANSFORMER RANGE by FERGUSON

This list of FERGUSON TRANSFORMERS represents our standard range which we are at present supplying the Radio trade.

This is by no means our complete range when taking into account those Transformers being supplied to manufacturers' special requirements.

Transformers of this type cannot possibly be listed in the space available and manufacturers are requested to contact us direct regarding their special Transformer requirements.

STANDARD RANGE TYPES

OUTPUT TRANSFORMERS

TYPE	PRIMARY	SECONDARY	RATING	TYPE	PRIMARY	SECONDARY	RATING
OP1	5000 and 2500 ohms S.E.	12.5, 8.0 & 2.3 ohms Voice Coil	10W	OP18	3800 ohms P-P	500, 250 and 125 ohms	60W
OP1A	5000 and 2500 ohms S.E.	300 ohm Line	10W	OP19A	5000 ohms P-P (30-10,000 C/s)	12.5, 8.0, 2.3 ohms Voice Coil	15W
OP2	5000 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W	OP19B	5000 ohms P-P (30-10,000 C/s)	500, 250 and 125 ohms	15W
OP3	6500 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W	OP20	11,600 8400 ohms P-P (P.A. Range)	500, 250, 166 & 125 ohms	150W
OP4	10,000 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W	OP21	8000 ohms P-P (30-15,000 C/s)	500/125 ohms	15W
OP5	5000, 6600, 10,000 ohms P-P	12.5, 8.0 & 2.3 ohms Voice Coil	15W	OP22	3250 ohms S.E. 85 M.A. (30-15,000 C/s)	2.3 or 500/125 ohms	10W
OP6	5000 ohms P-P	500, 250 and 125 ohms	15W	OP22	3250 ohms S.E. 85 M.A. (30-15,000 C/s)	12.5 or 8.4/2.1 ohms	10W
OP7	5000 ohms P-P	500, 250 and 125 ohms	15W	OP25	10,000 ohms P-P (20-30,000 C/s)	Any Two Impedances in 4 to 1 ratio e.g. OP25 500/125, OP25 8.4/2.1, OP25 10/2.3	50W
OP8	10,000 ohms P-P	500, 250 and 125 ohms	15W	OP25M	10,000 ohms P-P	500 ohm Line 10 Tappings	15W
OP9	5000, 6600, 10,000 ohms P-P	500, 250 and 125 ohms	15W	OP15M	5500 ohms P-P	800 ohm Line 10 Tappings	15W
OP10	5000 ohms P-P	500, 250 and 125 ohms	25W	L1	500 ohms	12.5, 8.0, 2.3 ohms	10W
OP11	6600 ohms P-P	500, 250 and 125 ohms	25W	U1	20,000, 20,000, 14,000, 10,000, 7000, 3000	2.3 ohms Voice Coil	10W
OP12	10,000 ohms P-P	500, 250 and 125 ohms	25W		2500 ohms P-P-R	S.E. Universal Speakers.	
OP13	5000, 6600, 10,000 ohms P-P	500, 250 and 125 ohms	25W				
OP14	5000 ohms P-P	500, 250 and 125 ohms	32W				
OP15	6600 ohms P-P	500, 250 and 125 ohms	32W				
OP16	10,000 ohms P-P	500, 250 and 125 ohms	32W				
OP17	5000, 6600, 10,000 ohms P-P	500, 250 and 125 ohms	32W				

CLASS B DRIVER AND INTERSTAGE TRANSFORMERS

TYPE	PRIMARY	SECONDARY	RATING	TYPE	PRIMARY	SECONDARY	RATING
IP1	Single 6J7G Triode 5 M.A. D.C. Unbalance	Class A1, AB1, P-P Grids 1	1	IP3	P.P. Class A, A1 Triodes 45°, 2A3's, etc	Class B P.P. Grids 800, 830B, etc.	2.3 or 2.8 or 1.15
IP2	Single 6V6 Triode 40 M.A. D.C. Unbalance	Class AB2 P.P. Grids	2.5	IP4	S.E. or P.P. Triodes	Class B P.P. Grids 800, 830B, etc.	2.3 or 1.15

MODULATION TRANSFORMERS

TYPE	PRIMARY	SECONDARY	RATING	TYPE	PRIMARY	SECONDARY	RATING
M25	6000 & 8000 ohms P-P	10,000, 7000, 5000 ohms, 100 M.H.	25W	M50M	Multi Primary	Multi Secondary	50W
M50	3000, 6600, 8000 ohms P-P	10,000, 7500, 6500, 5500, 4500, 3500 ohms 150 M.A.	50W	M125M	Multi Primary	Multi Secondary	125W

VIBRATOR TRANSFORMERS

TYPE	PRIMARY	SECONDARY	RATING	TYPE	PRIMARY	SECONDARY	RATING
6V/120	6V at 0.5A D.C.	150V at 25 M.A.		6V/250	6V at 3.4A D.C.	250V at 60 M.A.	
6V/200	6V at 2.9A D.C.	200V at 50 M.A.		8V/240/U	8V at 3.9A D.C. or 240V A.C.	250V at 60 M.A. 8.3V at 2A (A.C.) using EX9GT Non Sync. Operation	

POWER TRANSFORMERS

P30	340V A.C.	150V/150V at 30 M.A. 8.3V at 2A.
-----	-----------	----------------------------------

FILTER CHOKES

C30/25	30 Henries at 10V A.C. 100 C/s + 25 M.A. D.C.
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Our opinions in this connection are by no means unique, and a simple by an American design engineer empirical method has been suggested for arriving at the volume of enclosure for loudspeakers of various dimensions. The figure of volume derived by this method is conventional enough for 12-inch speakers, but gives a larger baffle volume for speakers of the seven and eight-inch class.

The empirical method is based on the following figures: Use a box which has a volume in cubic feet which is numerically equal to the nominal radius of the speaker in inches. Thus, using this method, a 12-inch speaker requires a cabinet volume of 6.0 cubic feet, and so on.

PORT AREA

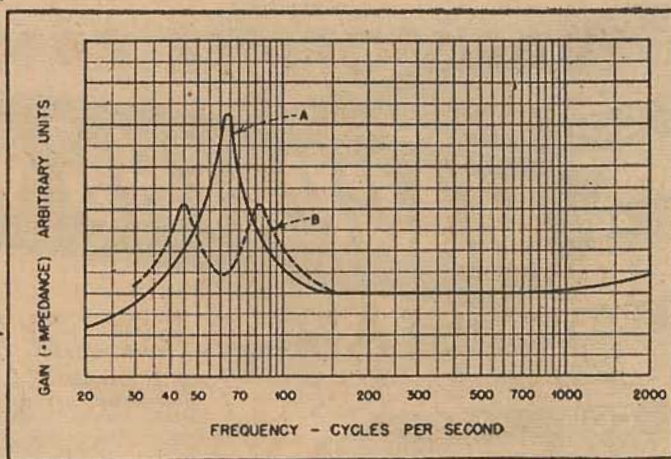
The port area is generally accepted as being equal to the actual radiating area of the cone, which is substantially less than that calculated from the nominal diameter of the speaker. For example, a typical 12-inch speaker requires an 11-inch hole for mounting, but the actual diameter of the useful section of the cone is only 10 inches. Resorting to an empirical formula again, the port opening may be taken as 0.8 times the area of the loudspeaker opening.

Cross-checking these figures with data previously published, it will be noted that the cabinet volume for a standard 12-inch loudspeaker is substantially the same, being six cubic feet. With a heavy duty 12-inch speaker, which can be expected to have a somewhat lower cone resonance, the volume could err on the side of liberality.

In the smaller sizes the volume suggested for a 10-inch and for an eight-inch speaker is substantially higher than given by the original formula.

Summing up all factors, the fol-

Showing how the vented enclosure damps down the speaker resonance, creating two smaller peaks as in curve B. The result is much smoother performance in this region.



lowing recommendations can be made:

1. For 12-inch loudspeakers, the enclosure volume should be not less than 6 cubic feet and up to 8 cubic feet for heavy-duty speakers, having a cone resonance around 55 c/s.

2. For 15-inch loudspeakers, the enclosure volume should be at least 8 cubic feet, and up to a maximum of 16. With such large speakers, the very low cone resonance will extend the cut-off in any case to about 45 c/s.

3. For 10 inch loudspeakers, the enclosure volume can be from 4 to 5 cubic feet.

4. For 8 inch loudspeakers, the enclosure volume should be from 3 to 4 cubic feet.

The only other loudspeaker likely to be mounted in a vented enclosure is a new seven-inch type, recently on sale in this country, which has an effective cone diameter substantially the same as a conventional eight-inch speaker. Because of this special feature it may be regarded as an eight-inch type for design purposes.

Two more points for our summary:

1. The vent area will normally be made equal to 0.8 times the area of the actual loudspeaker opening.

2. The installation of a "throat" around the vent, either inside or outside the cabinet tends to lower the resonance of the system and, within limits, has the effect of increasing the enclosure volume.

From a practical viewpoint we had no misgivings about the figures for 12-inch loudspeakers, vented enclosures for these units having been

built and tested on previous occasions. Our main interest was to investigate the performance of a small speaker in a cabinet rather oversized by previous conceptions.

Another point in mind was that many readers have 8-inch loudspeakers on hand or may be obliged to use a 7 or 8-inch speaker for reasons of cost and availability.

Accordingly, we constructed an enclosure approximating three cubic feet in volume with a vent of the specified dimensions.

SOME TESTS

The particular loudspeaker had a natural cone resonance at a frequency just over 100 c/s, which was rather higher than expected. However, when mounted in the vented enclosure, the output was maintained down to just under 60 c/s, below which it tapered off sharply. At the frequencies, by the way, the bulk of the output comes from the vent.

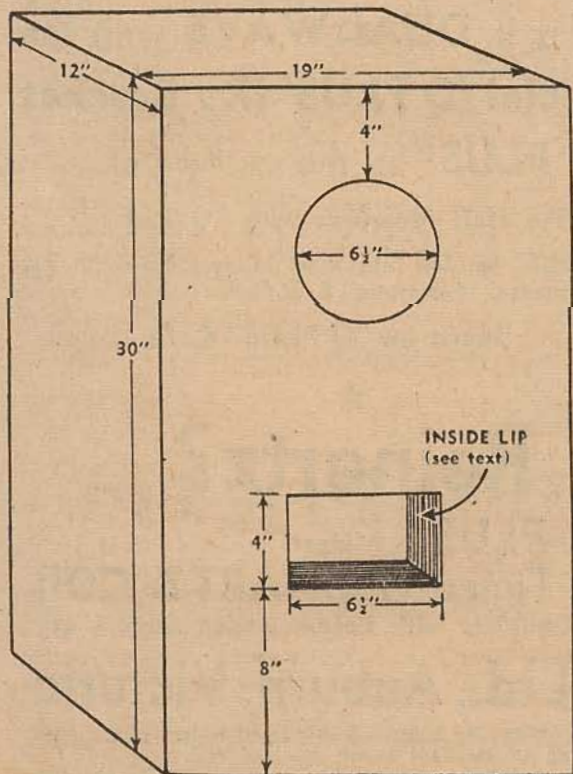
By way of interest we installed a throat, some three inches long, surrounding the vent on the inner side of the cabinet. This was found to produce a more gradual cut-off characteristic and, as far as could be judged by ear, to improve generally the performance of the enclosure below 100 c/s. In its final form the system delivered useful output down to 50 c/s, which was gratifying, considering the simplicity of the baffling arrangement, its moderate size, and the fact that the energy source was a relatively inexpensive 7-inch loudspeaker.

Although 50 c/s may seem well removed from the traditional 30 c/s, there are few loudspeakers in conventional cabinets which will produce fundamental tones at this frequency. You will find that a combination of this loudspeaker system with a set like the "Fidelity Five" gives very pleasing results.

HEAVY TIMBER

Having disposed in relatively simple fashion of the enclosure volume and the vent area, it remains to emphasize a few important constructional points.

In the first place it is useless to consider building a vented enclosure of light timber or even of sound-



This diagram gives constructional details of a vented enclosure for an 8 inch loud speaker. Figures relate to outside measurements.

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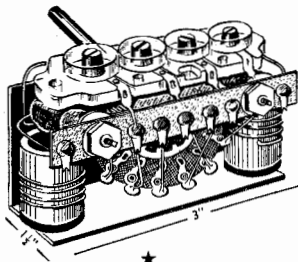
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absorbent board supported on medium weight battens. Such a cabinet would have very pronounced resonant effects and defeat the whole object of the scheme.

The handiest material is probably 1/4 in. plywood, although, in practice, anything from 5/8 in. to 1 in. plywood or solid stock could be employed. The wood should be supported internally by a suitable framework, all joints being glued and screwed. Either the back or the bottom must be removable for access to the interior, and this must be securely screwed in place.

It is wise also to cross-brace the front and rear faces of the cabinet to obviate resonant effects.

The figures given for volume naturally apply to the inside of the cabinet, and some small allowance

SUGGESTED VOLUME FOR VENTED ENCLOSURE

Nominal Speaker Diameter	Volume of Box (Cu. ft.)	Area of vent (sq. in.)
8	4	30
10	5	45
12	6	76
15	7.5	115

should be made for space occupied by the internal framework and bracing. It is wise to line all inside faces with hair felt, scraps of feltex, or other sound-absorbent material. If sound-absorbent board is employed, it will reduce perceptively the interior volume of the cabinet, and allowance should be made for this loss in the original design.

IMPORTANT FACTORS

The important factor is the interior volume, the actual shape and dimensions of the cabinet being less important. It is thus possible to build a cabinet in a rectangular form or of triangular section to fit into the corner of a room.

For a balanced appearance in rectangular cabinets it has been suggested that the proportions of depth: width: height be about 1: 1.7: 2.5, the frontal aspect being given by the two larger dimensions.

Our own experimental cabinet for a 7 or 8 inch speaker is somewhat taller and narrower than these proportions would suggest. Accordingly, the dimensions on the sketch were modified to approach the above proportions and, happily enough, the outside dimensions are very simple ones to work to. By the time allowance is made for the thickness of the timber, the interior volume will be just over the minimum recommended figure of 3 cubic feet.

For larger speakers, the cabinet will need to be substantially wider, with a smaller increase in the depth and height to give the required volume.

The position of the vent in relation to the loudspeaker does not appear to be critical, and the vent can thus be shaped and located on the front face of the cabinet to give the most balanced appearance.

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LIFE STORY OF THE MUSHROOM

(Continued from Page 15)

used in the making of bread, beer, wines, ciders and many other scarce commodities. The yeasts used for this purpose are fungoid growths of various species. Some of these are artificially grown for use, while others are found in natural states, such as the wine yeast. The latter are air borne cells of the fungus which settle on the grape fruit, develop, and give rise to the bloom of the ripe fruit. Thus the juice of these grapes ferments spontaneously without the addition of yeast.

Vinegar is produced by a ferment fungus *Mycoderma Aceti*, and it is mainly in the processes of fermentation that the fungi takes a place in industry.

OTHER USES

Some of the more novel uses of fungi might be mentioned to complete our survey.

In olden days and in parts of the world today the common "puff ball" was used as tinder for fire-making.

Sometimes the oak tree is attacked by the mycellium of a fungus which causes the wood to become stained green. This gives a very pretty effect and the wood is used in the manufacture of "Tunbridge Ware."

There is a very rough fungus called Polyporous often found growing on the trunks of trees. This has been used as a razor strop. *Daedalea quercina*, a very rough, coarse fungus, is employed as a curry comb.

Other fungi are used for snuff. Others possess an extractable dye-stuff.

There is a fairly common fungus like a mushroom with a very long stem and commonly named "Shaggy Cap" which blackens when boiled into a substitute for ink. Another has radiating gills which bend back in dry weather and straighten when wet, thus acting as a sort of weather indicator. Some are used for making corks, others for caps, aprons, picture frames and ornaments.

AS FOOD

The use of fungi as food has not been touched upon here to any extent. This aspect of fungi is one of the matters for the future, for many of them have a valuable food content. In Europe many fungi are used as food and sold in the markets and no doubt if the fungi to be found in Australia were to be properly classified so as to be easily identified we would have a greater choice in the early morning hunt than the common mushroom. The classification of fungi has not yet been seriously tackled in Australia.

However, from this resume it can be seen that fungi have an important place in human affairs and as time goes on more uses for them will be found. I make so bold as to prophesy that cures for many of our bodily ills may be found among the fungi.

IRC

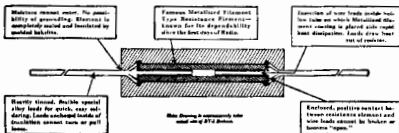
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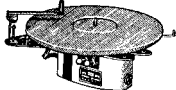
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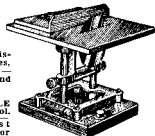


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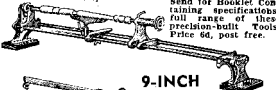
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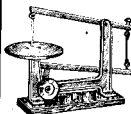


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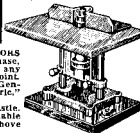


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FOR THE JUNIOR EXPERIMENTER

LET'S TALK ABOUT COMPONENTS—CONDENSERS

For the young enthusiasts, there is a special thrill in acquiring an old receiver which can be pulled to pieces for the parts. Subsequently, the chief problem is to know whether the parts are suitable for a particular circuit, and some of your questions along these lines will be answered in this and subsequent articles.

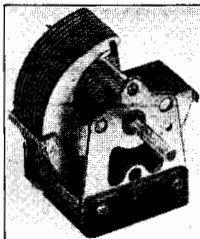
TAKE, for example, variable tuning condensers. During the past thirty years they have been manufactured in hundreds of different brands, all with differing plate shapes, sizes, numbers and spacing. Few of them are branded with a capacitance rating and it is far too complicated a business for the beginner to calculate the figure. One must usually be satisfied to assess the suitability of a condenser on a cursory examination.

Actually, we published a full-length article on the subject of condensers in the October, 1943, issue, which included the mathematical formula for calculating capacitance, and you can refer back to this issue if you have it on hand.

AVERAGE CAPACITY

Receivers to cover the broadcast band normally require a tuning condenser with a maximum capacitance of about .0005 mfd. You will find this value marked on many old circuits, although modern ones more often specify a .0004 mfd. condenser. Both figures are really approximations and it is safe to say that any condenser with a capacitance of between about .0004 and .0005 mfd. will do to tune a broadcast band receiver.

Small variations in the maximum and minimum capacitance of a condenser will mean a variation in the



An early Emmco condenser which was widely used both singly and in a ganged arrangement. Maximum capacitance of this 23-plate type is .00043 mfd. Many had fewer plates and lower capacitance.

exact coverage at the respective ends of the band, but this will be of no importance unless one is interested in hearing a particular station at either extreme of the frequency range.

While on the subject of ratings, it is well to point out that a con-

denser with substantially lower capacitance than .0004 mfd. will not tune the whole of the broadcast band, even if adjustments are made to the coil.

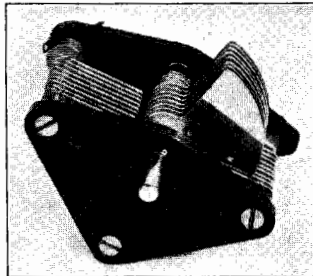
The highest tuning frequency is governed by the capacitance across the coil itself, by the valve and wiring capacitances and by the minimum capacitance of the tuning condenser. With a normal broadcast coil this frequency will be in the region of 1500-1600 kc. As the condenser is brought into mesh, the resonant frequency becomes lower and, as previously mentioned, the condenser needs to be at least .0004 mfd. for the resonant frequency to reach 550 kc.—the lower limit of the broadcast band.

If the condenser has a maximum capacitance of, say, only .00025 mfd., it will not tune lower than about 750 kc. The only way this portion of the band could be included with the same coil would be to switch a .0002 mfd. mica condenser in parallel with the tuning condenser and cover the band in two sections.

COIL DATA

Or you could wind another coil with, say, one-third more turns on all windings, and be content to cover stations in the centre of the band only, missing out at the high and low frequency limits. The significant point is that it is not practicable to tune the whole broadcast band with a condenser smaller than about .0004 mfd.

Many readers have asked us to specify broadcast band coils for some shortwave set they have constructed, using a .0001 mfd. tuning condenser,



With bakelite and plates and semi-circular aluminium rotor plates this condenser is typical of the very early types. The conventional .0005 mfd unit had about 23 plates.



Typical of the condensers used in the late '20's is this "Pilot" type, with specially-shaped rotor plates. This condenser also has 23 plates in all and a capacitance of .0005 mfd.

The

5

BAND KIT

FOR YOUR LATEST RIG

TYPE K120 . . . PRICE £3.10.6

consisting of 15 coils:—Aerial, R.F. and Oscillator in the following band.

10 metres	30 MC	to	11 MC.
20 metres	16 MC	to	5.5 MC.
40 metres	8 MC	to	3.0 MC.
80 metres	4 MC	to	1.5 MC.
Broadcast	1600 KC	to	550 KC.

This coil kit is suitable for use with a Stromberg H. Type condenser and will give a band spread as above. A smaller gang will give less overlap at each end and amateurs may use our type CV49 double spaced condensers for band spreading in conjunction with the H gang. A six bank double sided switch with shorting plate, the 2nd side being used to short circuit all unused coils. IT IS NECESSARY to shield between the Aerial, R.F. and Oscillator sections of switch. The following padding condensers will be needed.

Broadcast Band	R.C.S. Type P21 5 plate adjustable.
80 metres	R.C.S. Type P21 5 plate adjustable.
40 metres	0015 fixed condenser.
20 metres	004 fixed condenser.
10 metres	004 fixed condenser.

These are made to suit R.C.S. Intermediate Transformers. Type IF162 and Type IF163.

5 BAND SWITCH Type SW17

A six bank double sided switch with shorting plate. The 2nd side being used to short circuit all unused coils. IT IS NECESSARY to shield between the Aerial, R.F. and Oscillator sections of the switch.



DUAL WAVE UNITS

DW 29 Standard 4/5 Dual Wave Units £1/14/-



5 BAND SHORT WAVE COILS

	Price
H124 10 metre Aerial	4/6
H125 10 metre R.F.	4/6
H126 10 metre Oscillator	4/6
H127 20 metre Aerial	4/6
H128 20 metre R.F.	4/6
H129 20 metre Oscillator	4/6
H130 40 metre Aerial	4/6
H131 40 metre R.F.	4/6
H132 40 metre Oscillator	4/6
H133 80 metre Aerial	4/6
H134 80 metre R.F.	4/6
H135 80 metre Oscillator	4/6



RADIO FREQUENCY CHOKES

RF81 Silk Honeycomb R.F.	1/9
RF82 3 pie 1.7 M/H R.F.	4/6
RF83 4 pie 2.5 M/H R.F.	4/6
RF84 5 pie 4.0 M/H R.F.	4/6
RF85 6 pie 7.0 M/H R.F.	4/6
RF 86 Cotton Honeycomb R.F.	1/6
RF106 Vibrator Low Tension R.F.	4/3

COIL FORMERS, 6 PIN PLUG IN

These transparent coil formers are moulded from polystyrene powder. They are engraved for frequency and type and indented for color spotting. May also be grooved for space winding. Socket pins are heavily nickel plated.
Type 124 1 1/2" dia. 3/3
Type 125 1 1/4" dia. 3/5



STANDARD INTERMEDIATE TRANSFORMERS

Standard 460 k.c.

IF162 1st Stage Permatune Iron Core	13/9
IF163 2nd Stage Permatune Iron Core	13/9
IF164 Low Gain Permatune Iron Core	13/9
Standard 175 k.c.	
IE174 1st Stage Permatune Iron Core	13/9
IE175 2nd Stage Permatune Iron Core	13/9



5 BANK COIL TRIMMER Type CG27. Price 4/6.

5- 2 plate trimmers complete in one solid block of trolitul.

MIDGET VARIABLE CONDENSERS

Star Type with Face Support.			
Type	mmfd.	Plates.	Price.
CV34	10	2	4/-
CV35	15	3	4/3
CV36	25	4	4/6
CV37	35	5	4/9
CV38	50	7	5/3
CV39	70	9	5/10
CV40	100	14	6/6

5 BAND INDICATOR PLATE Type HH35 Price 2/-.

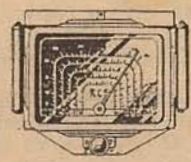
This is a solid metal plate in black with raised letters. Diam. 1 1/2 ins. with 3-8 ins. centre hole, to fit standard switch.

Marked 10, 20, 40, 80 and B/C.



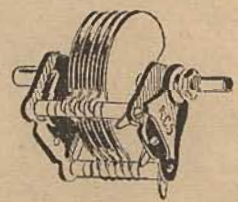
PADDING CONDENSERS

P21 460 K.C.	2/6
P22 262 K.C.	3/-
P23 175 K.C.	3/-



DIALS

DA7 D/W Portable Kit Dial 9/-



R.C.S. RADIO PTY. LTD.

174 Canterbury Rd., Canterbury, N.S.W., Australia.

or one even smaller. The same remarks apply, of course. With such a small condenser, you could not expect to tune much more than a quarter of the band in one sweep. It would be necessary to have three or four sets of coils, each with a progressively larger number of turns on the windings to cover the respective portions of the band. Or, alternatively, some system of switching would be necessary to bring into circuit small mica condensers in parallel with the tuning capacitance.

So much for the electrical ratings. Broadly speaking, tuning condensers fall into four groups, and this fact is some help to the amateur constructor in assessing their capacitance and usefulness.

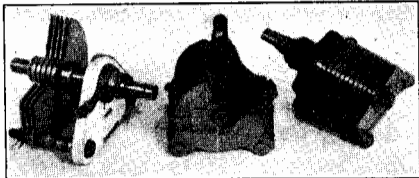
The first group includes all those condensers which have been manufactured during the past thirty years for use on the broadcast band. The number, size and shape of the plates varies a good deal, but, for reasons already stated, most of them have a capacitance value of between .0004

condensers, midgets vary in their exact design, but most of them use from 19 to 23 plates to obtain a capacitance of .0001 mfd.

Chief exception to this general rule is provided by some English condensers, which employ closer spacing and achieve the same capacitance either with the same number of very small plates or about nine plates rather larger than fitted to the conventional midget.

The fourth group would include a variety of midget condensers, employing fewer plates than normal or double spaced types. These find their application in special short-wave receivers, VHF equipment, amateur transmitters, and so on. Their capacitance may be anything from .000015 to .00005 mfd., and they will generally be far too small for anything but the special purposes suggested. Broadly speaking, nothing less than .0001 mfd. is of much use for reaction control.

Quite apart from the capacitance rating, the mechanical construction



A group of midget condensers, each with a maximum capacitance of about .0001 mfd. The two on the right have 23 plates in all. That on the left has only nine plates, but the area is much larger and the spacing less.

and .0005 mfd. Because of this, they are all suited for use in small regenerative sets.

Since the capacitance is dependent also on plate size and spacing, the actual number of plates is not in itself a precise check on maximum capacitance. However, most broadcast band tuning condensers seem to end up with about 20 plates in all, so this figure is a handy guide. So, if a condenser has about 20 full-size plates, it is fairly safe to say that it will have a capacitance of at least .0004 mfd. and be useful as a broadcast tuning condenser.

The second group includes condensers having full-sized plates, but either fewer in number or more widely spaced than usual. Such condensers traditionally had a capacitance rating of between .00025 and .00015 mfd., and found their widest application in old-style short-wave receivers. They can still be used for this purpose or, if space is no object, they can be used for reaction or aerial coupling condensers.

MIDGET CONDENSERS

Then there are midget condensers—of two general classes. First of these has a capacitance rating of about .0001 mfd., which has been a traditional value to specify for reaction control. Like the larger con-

denser has an important bearing on its usefulness in a receiver.

A good condenser will rotate smoothly throughout the full range of travel, without either sloppiness or binding. Either failing will make a regenerative receiver difficult to tune, and a half-hour devoted to packing or adjusting the bearings before installation will be time well spent. The bearings should be just tight enough to hold the rotor plates to any position where they may be set.

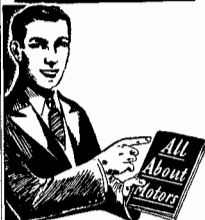
It is most important, of course, that the plates do not touch as the condenser is rotated. Slight misalignment of the two sets of plates will not affect the efficiency of a single gang condenser, although it can upset the tracking of a ganged unit.

The insulating material between the plates may be anything from ceramic or glass to very ordinary-looking fibre. Broadly speaking, the class of insulation is unimportant in a broadcast band condenser.

Bearing these various points in mind, you should now be in a better position to judge the usefulness or otherwise of any condenser which happens to be on hand. If the condenser appears to have the right capa-

(Continued on Page 87)

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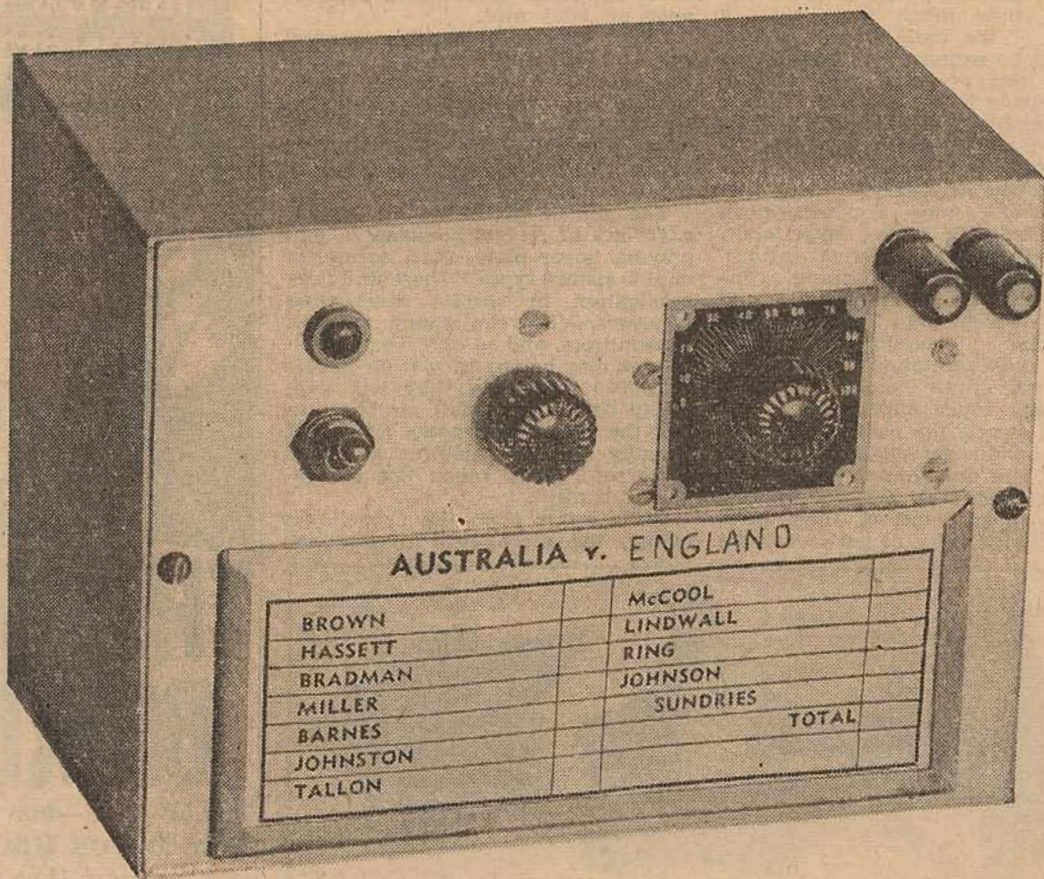
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The initial success of our Test Cricket team has intensified the interest with which all Australians will follow the Test match broadcasts from England. Past experience has shown that an easily made receiver for local-station listening will be greeted by our readers with great enthusiasm. This one has been specially designed to bring you the rebroadcast with the maximum of comfort and convenience.

THE TEST MATCH SPECIAL

THIS receiver is one more example of adapting simple and well-known circuits to a definite use. There is nothing at all new in the idea: in fact, we used it in essentially the same form many years ago when the Test Matches were played in England. But, if our judgment is sound, there will be just as great a demand for it today as at any other time, and we have taken care to see that it can be built by anyone from parts which are in good supply—or, at least, as good as we can expect these days.

What is it? Maybe it would be as well to start by describing what it is all about.

From the listener's point of view, there is nothing wrong with having Test matches in England except the fact that play takes place between about 8 pm and 3 am, Eastern

Standard Time. Therefore, we have either to sit up half the night, as most of us do when things become exciting, or else wait for the story in the papers next morning.

This procedure happens to be rather wearing to the average constitution, and during the winter months it is often a cold and uninviting process as well. It is no solution to bring the radio set into your bedroom, assuming it is a set which

can be moved about, as there are often others to be considered who may not be able to sleep with a radio in action re-broadcasting a cricket match.

We have proved in the past that a simple receiver for bedside listening, using headphones, is just about the ideal thing for such cases. Moreover, it is a splendid set for hearing programmes when you are unlucky enough to be ill in bed, or just too lazy to get up on Sunday mornings.

If in the ordinary course of things you like listening to radio when someone else wants to work, or just sit in silence, there you are!

Now, headphones are liable to be awkward and heavy things to wear, particularly if you are in bed. Our idea, therefore, is that you remove the headband from your phones, place one of them under your pil-

Above: A front view of the receiver, showing the score-card. The tuning knob has a dial plate. The second knob controls reaction. Headphone terminals, on-off switch, and indicator bezel are also seen.

low, and give the other one to your wife, if you happen to be married. By scooping away an appropriate amount of kapok immediately above the phones, you have a natural volume control, allowing you to select a faint or a strong signal, whichever you prefer.

If by some chance you should drop off to sleep, there is no need to worry. The headphone won't get in your way, and our set uses so little current that the cost of running is negligible, and it would be quite happy to play away whether you are listening or not.

You will find a multitude of uses for it, and it will well repay you for the slight cost of labor involved in its manufacture.

If you live in an area where signals are strong, you can expect quite reasonable loud-speaker signals if you should want them, although a small set such as this is not primarily intended for speaker work.

THE VALVE

The set, in brief, is a single-valve affair, using a 6J8G, ECH35, or equivalent. This valve is chosen because it is a dual type with a pentode and a triode section which may be used separately in our circuit, although both use the same cathode stream. We do not advise the use of other converter types, such as the 6K8, because the internal construction of these valves is not the same. Results of a kind might be expected, but, in general terms, these valves are unsuitable.

We could have used several other valves of the dual type with equally good results, but these are not in good supply. The 6SN7, for instance, and even the 6A6 would do well, with slight and obvious circuit alterations. The 6F7 would probably be slightly better still, but all these types are in short supply, and, in any case, the difference between them would be slight. The 6J8 and ECH35 types, on the other hand, are reasonably easy to obtain.

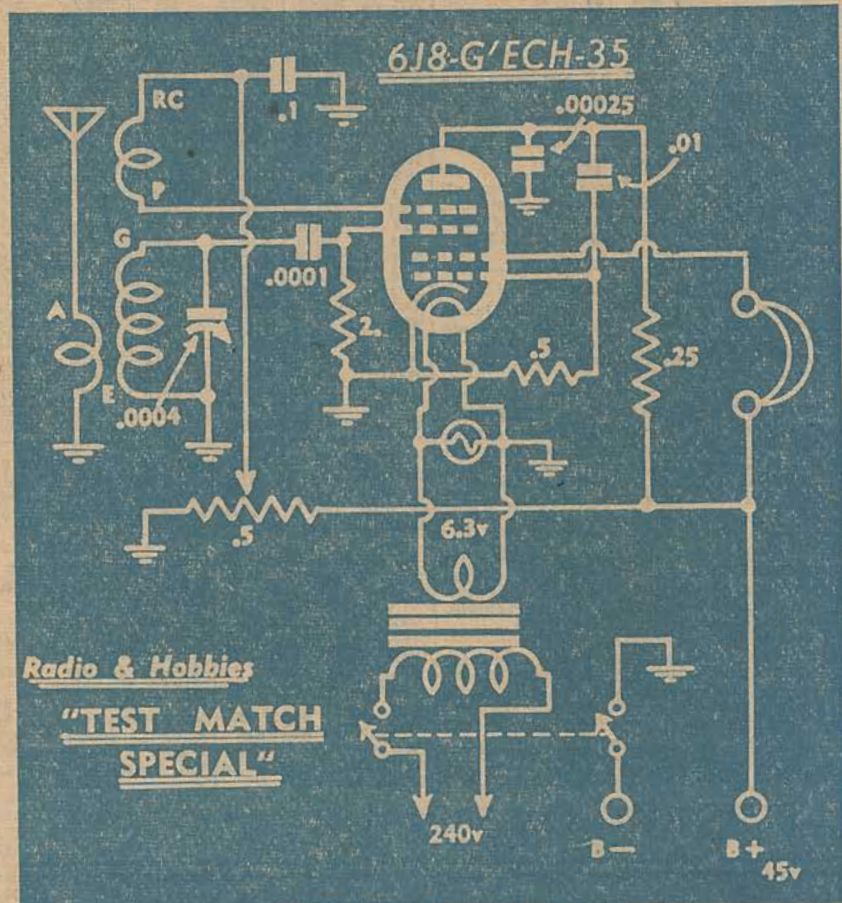
The pentode section of the valve is used as a regenerative detector, and the triode section as an audio amplifier. The reaction circuit is one which has proved very satisfactory. As you will see, the screen of the valve is the virtual plate, the plate itself being coupled electronically by the normal electron stream of the valve. This scheme gives smooth reaction, easily controlled by means of a potentiometer which varies the screen voltage.

REACTION CONTROL

Condenser - controlled reaction would probably have worked out quite as well, but the condenser is much bigger, and costs more than a potentiometer. Space, as the layout shows, is quite a factor in building the set, and, for all these reasons, the potentiometer was used.

The coil may be a commercially-made type, although the set is sufficiently flexible for a home-wound

TEST MATCH SPECIAL CIRCUIT



The circuit is typical of a simple one-valver, except that a transformer is used for the filament supply and a battery for high tension. Drain is about 3 mills.

coil to be used, if wound on a small piece of former.

One coil we used successfully was wound on a piece of $\frac{1}{4}$ inch former $2\frac{1}{2}$ inches long. The aerial coil had 20 turns, grid coil 120 turns, and reaction coil 55 turns, all wound with 35 gauge wire, with 1/16 inch spacing between windings. It worked just as well as the manufactured types.

Coupling between the detector and audio sections of the set is by the resistance-capacity method, as there is not enough room to use either a

choke or transformer. Any increase in volume would be of doubtful value, as there is plenty of signal for headphone listening, even under comparatively adverse conditions.

The set uses an indirectly heated valve for several reasons. The first and most important is that no suitable battery valves are available which do not use rather a heavy filament current. As the set will probably be used for long periods, this would call for frequent battery replacement. By wiring in a small filament transformer, however, we

PARTS LIST

- Cabinet and chassis (see text)
- Valve 1 6J8-G or ECH35
- 1 6.3v. filament transformer
- 1 Tuning condenser (small broadcast)
- 1 Reinartz coil
- 1 D.P.S.T. switch
- 1 45v. Minimax battery
- 1 0.5 meg. potentiometer
- 1 Octal valve socket

RESISTORS

- 1 2.0 meg.
- 1 0.5 meg.
- 1 0.25 meg.

CONDENSERS

- 1 0.1 mfd.
- 1 .01 mfd.
- 1 .00025 mfd.
- 1 .0001 mfd.

SUNDRIES

- 6.3v. dial lamp, lamp holder and bezel, grid clip, 2 terminals, 2 knobs, hook-up wire, solder lugs, nuts and bolts, power flex, battery plug, tuning dial plate.

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"MINIVOX" 3-valve AC Kit, complete with all parts, and attractive leatherette cabinet. \$10/12/6.
(Freight extra).

"MINIMINOR"
4-valve personal portable, uses all midrange parts, Hi-GN super-het circuit, Jln. Roia, complete Kit with beautiful shoulder strap carrying case. \$12/19/6.
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"R. & H. 807 P/P AMPLIFIER"
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5-valve B/cast vibrator chassis, complete with valves, vibrator, but less 8pk. and cabinet—custom built, ready to switch on—Discontinued line, hence remarkably low price of \$13/10/-. Few only (Freight extra).

"CHASSIS" Cad-plated, Minivox, 6/6.
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We urgently require space in our factory, hence we are clearing out all surplus components, parts, etc. We have packed them into lots of 8lb. They include lots of Radio and Electronic parts, coils, resistors, condensers, chassis, sockets, hardware, etc. Would normally cost about 40/-. but as we must have space, we offer this 8lb. parcel for 15/-. (Freight extra).

TOOLS
"Bernard" USA, Side-cutters 7in., 21/2.
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6in. above, with insul. handle, 5in. 4/11
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"King Dick" socket Ratchet Set, 8in. pieces in set, with Ratchet, and extension bar 94/5
Set of seven Double ended Spanners, 1-1in to 1/2in. 2/10
4in. Crescent shifting spanner 7/10
10in. Cad. Plated Multigrips 10/4
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Engineers' Ratchet Hand Braces Drill for Straight Shank Drills 28/2
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1G6	20/9	8AUN	21/10	6BR7	18/9
18A	17/10	6BD	18/4	6V6	18/10
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1Q5	22/10	6CZ	17/10	128Q7	18/4
1R3	20/6	6CR	21/3	14C3	16/3
1R5	20/6	6GR	20/9	14C7	17/3
174	20/6	6H6	19/3	14F7	17/3
18A	12/9	6J5	15/9	14ST	17/3
284	20/6	6J6	28/-	14W7	17/3
3V4	20/6	6J7	18/4	132L7	23/3
5U4	19/3	4K7	20/6	88	14/7
3V4	19/10	4K8	18/10	807	18/6
5V3	14/7	6L4	18/10	813	115/-
9061	21/-	6L7	21/6	837	25/-
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Kingsley Aer Rf osc 8/8
(Post extra).

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TRANSFORMERS
5000, 7000 ohm 10/1
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The smallest power transformer made in Australia, 20/7.
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XTAL PICKUPS
Acos GP10 complete with cart, 48/8.

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Midget type mike, ideal for lapel, or Desk Aid Mikes, have inbuilt 2 meg. load made by brush. 29/-.

JUST ARRIVED
Q plus Midget Dual valve coil Kits, complete unit, 44/-.
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DP 47 Dials 7/11
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Vol. controls 3/9

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485-485 volt 17/1
71-11V 2/6

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Rola 3" 24/2
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28V-200V-150 mil 67/15

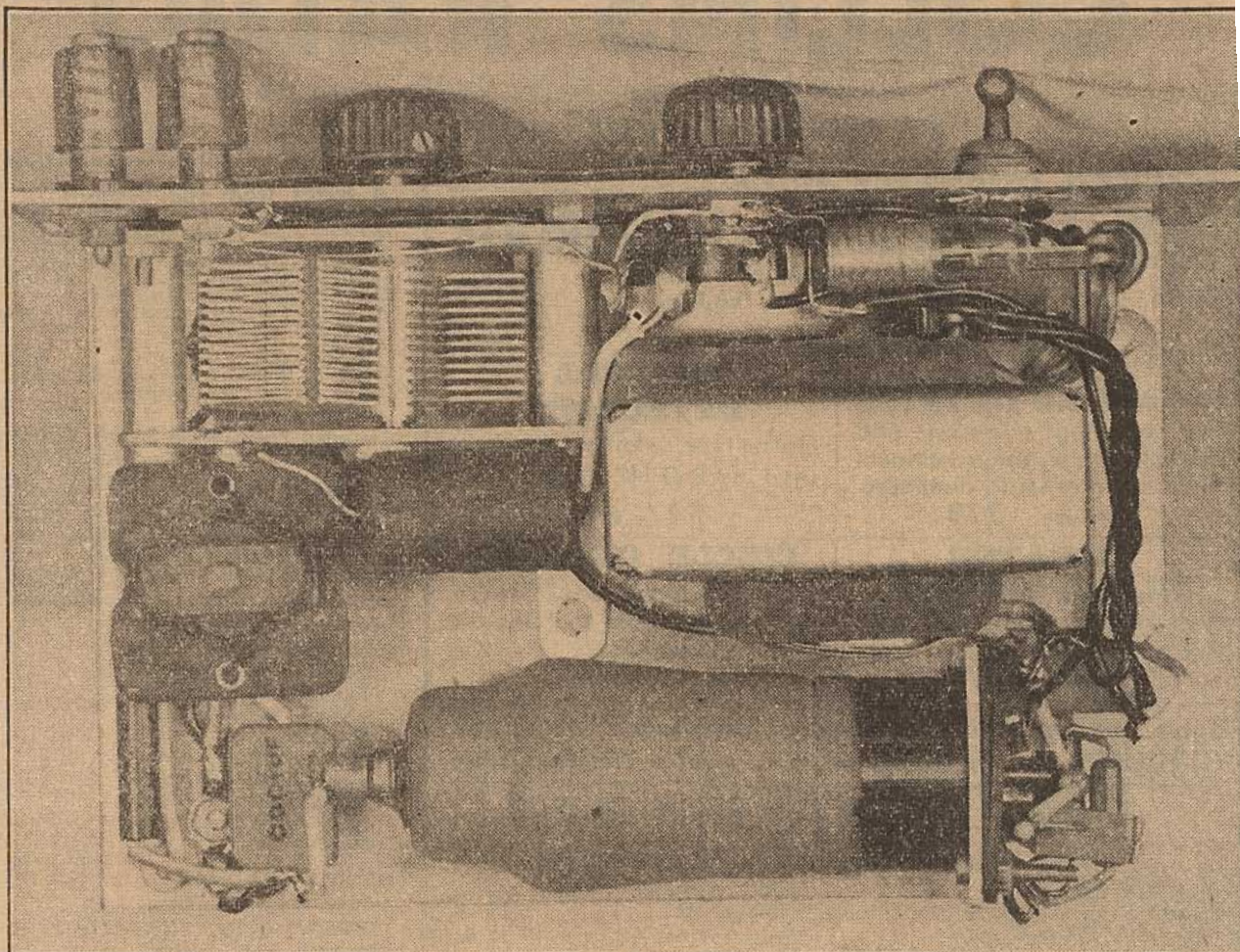
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(3) only Transmitters, English, 28V-Dc input, Rec. covers 3-7Mcs. Valves 6.3V type. Ho. etc. Transmitter Range 3-7Mcs. uses 807 in output stage—complete unit 220/10/0
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39.1, 39.2, 39.3, 39.4, 39.5, 39.6, 39.7, 39.8, 39.9, 40.0, 40.1, 40.2, 40.3, 40.4, 40.5, 40.6, 40.7, 40.8, 40.9, 41.0, 41.1, 41.2, 41.3, 41.4, 41.5, 41.6, 41.7, 41.8, 41.9, 42.0, 42.1, 42.2, 42.3, 42.4, 42.5, 42.6, 42.7, 42.8, 42.9, 43.0, 43.1, 43.2, 43.3, 43.4, 43.5, 43.6, 43.7, 43.8, 43.9, 44.0, 44.1, 44.2, 44.3, 44.4, 44.5, 44.6, 44.7, 44.8, 44.9, 45.0, 45.1, 45.2, 45.3, 45.4, 45.5, 45.6, 45.7, 45.8, 45.9, 46.0, 46.1, 46.2, 46.3, 46.4, 46.5, 46.6, 46.7, 46.8, 46.9, 47.0, 47.1, 47.2, 47.3, 47.4, 47.5, 47.6, 47.7, 47.8, 47.9, 48.0, 48.1, 48.2, 48.3, 48.4, 48.5, 48.6, 48.7, 48.8, 48.9, 49.0, 49.1, 49.2, 49.3, 49.4, 49.5, 49.6, 49.7, 49.8, 49.9, 50.0, 50.1, 50.2, 50.3, 50.4, 50.5, 50.6, 50.7, 50.8, 50.9, 51.0, 51.1, 51.2, 51.3, 51.4, 51.5, 51.6, 51.7, 51.8, 51.9, 52.0, 52.1, 52.2, 52.3, 52.4, 52.5, 52.6, 52.7, 52.8, 52.9, 53.0, 53.1, 53.2, 53.3, 53.4, 53.5, 53.6, 53.7, 53.8, 53.9, 54.0, 54.1, 54.2, 54.3, 54.4, 54.5, 54.6, 54.7, 54.8, 54.9, 55.0, 55.1, 55.2, 55.3, 55.4, 55.5, 55.6, 55.7, 55.8, 55.9, 56.0, 56.1, 56.2, 56.3, 56.4, 56.5, 56.6, 56.7, 56.8, 56.9, 57.0, 57.1, 57.2, 57.3, 57.4, 57.5, 57.6, 57.7, 57.8, 57.9, 58.0, 58.1, 58.2, 58.3, 58.4, 58.5, 58.6, 58.7, 58.8, 58.9, 59.0, 59.1, 59.2, 59.3, 59.4, 59.5, 59.6, 59.7, 59.8, 59.9, 60.0, 60.1, 60.2, 60.3, 60.4, 60.5, 60.6, 60.7, 60.8, 60.9, 61.0, 61.1, 61.2, 61.3, 61.4, 61.5, 61.6, 61.7, 61.8, 61.9, 62.0, 62.1, 62.2, 62.3, 62.4, 62.5, 62.6, 62.7, 62.8, 62.9, 63.0, 63.1, 63.2, 63.3, 63.4, 63.5, 63.6, 63.7, 63.8, 63.9, 64.0, 64.1, 64.2, 64.3, 64.4, 64.5, 64.6, 64.7, 64.8, 64.9, 65.0, 65.1, 65.2, 65.3, 65.4, 65.5, 65.6, 65.7, 65.8, 65.9, 66.0, 66.1, 66.2, 66.3, 66.4, 66.5, 66.6, 66.7, 66.8, 66.9, 67.0, 67.1, 67.2, 67.3, 67.4, 67.5, 67.6, 67.7, 67.8, 67.9, 68.0, 68.1, 68.2, 68.3, 68.4, 68.5, 68.6, 68.7, 68.8, 68.9, 69.0, 69.1, 69.2, 69.3, 69.4, 69.5, 69.6, 69.7, 69.8, 69.9, 70.0, 70.1, 70.2, 70.3, 70.4, 70.5, 70.6, 70.7, 70.8, 70.9, 71.0, 71.1, 71.2, 71.3, 71.4, 71.5, 71.6, 71.7, 71.8, 71.9, 72.0, 72.1, 72.2, 72.3, 72.4, 72.5, 72.6, 72.7, 72.8, 72.9, 73.0, 73.1, 73.2, 73.3, 73.4, 73.5, 73.6, 73.7, 73.8, 73.9, 74.0, 74.1, 74.2, 74.3, 74.4, 74.5, 74.6, 74.7, 74.8, 74.9, 75.0, 75.1, 75.2, 75.3, 75.4, 75.5, 75.6, 75.7, 75.8, 75.9, 76.0, 76.1, 76.2, 76.3, 76.4, 76.5, 76.6, 76.7, 76.8, 76.9, 77.0, 77.1, 77.2, 77.3, 77.4, 77.5, 77.6, 77.7, 77.8, 77.9, 78.0, 78.1, 78.2, 78.3, 78.4, 78.5, 78.6, 78.7, 78.8, 78.9, 79.0, 79.1, 79.2, 79.3, 79.4, 79.5, 79.6, 79.7, 79.8, 79.9, 80.0, 80.1, 80.2, 80.3, 80.4, 80.5, 80.6, 80.7, 80.8, 80.9, 81.0, 81.1, 81.2, 81.3, 81.4, 81.5, 81.6, 81.7, 81.8, 81.9, 82.0, 82.1, 82.2, 82.3, 82.4, 82.5, 82.6, 82.7, 82.8, 82.9, 83.0, 83.1, 83.2, 83.3, 83.4, 83.5, 83.6, 83.7, 83.8, 83.9, 84.0, 84.1, 84.2, 84.3, 84.4, 84.5, 84.6, 84.7, 84.8, 84.9, 85.0, 85.1, 85.2, 85.3, 85.4, 85.5, 85.6, 85.7, 85.8, 85.9, 86.0, 86.1, 86.2, 86.3, 86.4, 86.5, 86.6, 86.7, 86.8, 86.9, 87.0, 87.1, 87.2, 87.3, 87.4, 87.5, 87.6, 87.7, 87.8, 87.9, 88.0, 88.1, 88.2, 88.3, 88.4, 88.5, 88.6, 88.7, 88.8, 88.9, 89.0, 89.1, 89.2, 89.3, 89.4, 89.5, 89.6, 89.7, 89.8, 89.9, 90.0, 90.1, 90.2, 90.3, 90.4, 90.5, 90.6, 90.7, 90.8, 90.9, 91.0, 91.1, 91.2, 91.3, 91.4, 91.5, 91.6, 91.7, 91.8, 91.9, 92.0, 92.1, 92.2, 92.3, 92.4, 92.5, 92.6, 92.7, 92.8, 92.9, 93.0, 93.1, 93.2, 93.3, 93.4, 93.5, 93.6, 93.7, 93.8, 93.9, 94.0, 94.1, 94.2, 94.3, 94.4, 94.5, 94.6, 94.7, 94.8, 94.9, 95.0, 95.1, 95.2, 95.3, 95.4, 95.5, 95.6, 95.7, 95.8, 95.9, 96.0, 96.1, 96.2, 96.3, 96.4, 96.5, 96.6, 96.7, 96.8, 96.9, 97.0, 97.1, 97.2, 97.3, 97.4, 97.5, 97.6, 97.7, 97.8, 97.9, 98.0, 98.1, 98.2, 98.3, 98.4, 98.5, 98.6, 98.7, 98.8, 98.9, 99.0, 99.1, 99.2, 99.3, 99.4, 99.5, 99.6, 99.7, 99.8, 99.9, 100.0, 100.1, 100.2, 100.3, 100.4, 100.5, 100.6, 100.7, 100.8, 100.9, 101.0, 101.1, 101.2, 101.3, 101.4, 101.5, 101.6, 101.7, 101.8, 101.9, 102.0, 102.1, 102.2, 102.3, 102.4, 102.5, 102.6, 102.7, 102.8, 102.9, 103.0, 103.1, 103.2, 103.3, 103.4, 103.5, 103.6, 103.7, 103.8, 103.9, 104.0, 104.1, 104.2, 104.3, 104.4, 104.5, 104.6, 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133.3, 133.4, 133.5, 133.6, 133.7, 133.8, 133.9, 134.0, 134.1, 134.2, 134.3, 134.4, 134.5, 134.6, 134.7, 134.8, 134.9, 135.0, 135.1, 135.2, 135.3, 135.4, 135.5, 135.6, 135.7, 135.8, 135.9, 136.0, 136.1, 136.2, 136.3, 136.4, 136.5, 136.6, 136.7, 136.8, 136.9, 137.0, 137.1, 137.2, 137.3, 137.4, 137.5, 137.6, 137.7, 137.8, 137.9, 138.0, 138.1, 138.2, 138.3, 138.4, 138.5, 138.6, 138.7, 138.8, 138.9, 139.0, 139.1, 139.2, 139.3, 139.4, 139.5, 139.6, 139.7, 139.8, 139.9, 140.0, 140.1, 140.2, 140.3, 140.4, 140.5, 140.6, 140.7, 140.8, 140.9, 141.0, 141.1, 141.2, 141.3, 141.4, 141.5, 141.6, 141.7, 141.8, 141.9, 142.0, 142.1, 142.2, 142.3, 142.4, 142.5, 142.6, 142.7, 142.8, 142.9, 143.0, 143.1, 143.2, 143.3, 143.4, 143.5, 143.6, 143.7, 143.8, 143.9, 144.0, 144.1, 144.2, 144.3, 144.4, 144.5, 144.6, 144.7, 144.8, 144.9, 145.0, 145.1, 145.2, 145.3, 145.4, 145.5, 145.6, 145.7, 145.8, 145.9, 146.0, 146.1, 146.2, 146.3, 146.4, 146.5, 146.6, 146.7, 146.8, 146.9, 147.0, 147.1, 147.2, 147.3, 147.4, 147.5, 147.6, 147.7, 14

A BIRDSEYE VIEW OF THE TEST MATCH SPECIAL



How the parts are laid out above the chassis. The tuning condenser is at the top left, next the reaction control and the on-off switch. The indicator lamp is located right above this switch. At the bottom left is a manufactured type of coil, with the grid condenser and leak also visible. The valve is an ECH35 mounted on a bracket turned up from the chassis. The audio stage components are mounted on the socket itself. The filament transformer is on the chassis at right centre. The B battery fits underneath the chassis.

can accommodate the filament current quite easily, with a power consumption of less than 2 watts — hardly enough to operate the power meter. In fact, if the set were left running night and day, the effect on the light bills would scarcely be noticed.

The use of the transformer does not involve any danger to the listener, as there is no AC, or any high voltages associated with the headphones. The 45-volt B battery is connected to the phones, but in any case these are under the pillow, and it would be almost impossible for the listener to come into effective contact with this voltage, in bed or out of it. And, if he did, the voltage is so low that it could barely be detected, and even then with no danger or inconvenience.

It would be rather uneconomical, on the other hand, to use an AC power supply for the 45 volts required for the receiver. The transformer would not cost a great deal more, it is true, but there would be a rectifier and filter to be considered, all of which would greatly increase

the cost of the set, in addition to increasing its size.

CURRENT DRAIN

As the drain of the set is approximately 3 milliamps, it is much more convenient to use a small Minimax type of B battery. This battery is not costly, and, with such a low drain, it will last for many months with average use—appreciably longer at any rate than it would in the average portable receiver, with its higher battery drain. There is not much point in using a high tension higher than 45 volts for headphone operation. Volume would be greater, but, as it is, there is plenty for the purpose.

Coming now to mention of other components, we have ascertained that there are at least two small tuning condensers available, one being an imported English type, and the other a locally-made job with solid dielectric separating the condenser plates. The imported condenser is much the larger of the two, and for this reason we used it in

the original model to make sure there was space in the lay-out for either type.

It would be possible at a pinch to use a full-sized single gang, of which there are a number on the market. It would overhang the chassis by a small margin, and would require a slightly larger cabinet, but there is no objection to its use if you happen to have one handy. You will need to be a little more careful in placing your components, particularly the tuning coil, to fit everything into the smaller space. Results in all cases will be about the same.

GANG MOUNT

The imported gang can be screwed to the front panel for support or fitted with small feet for fastening to the chassis itself. The locally-made condenser has a one-hole mounting.

We have fitted the set with an indicator lamp and bezel which, with the on-off switch, will indicate when the set is turned on. The switch is of the double-circuit type, one sec-

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A letter from the West—

Many thanks for the parts which I ordered. They arrived in good condition and much sooner than I expected. I might say that I usually take slogans such as yours with a grain of salt, but in your case you certainly live up to it. As far as I am concerned you have got the latest mail order in the Commonwealth!

Once again thanking you for good order in which I received the parts, not to mention the speed!
—A.H.

—and from New South Wales

I find your service, in these days when it seems to be the exception rather than the rule, of the highest at all times and, I think, a great criterion for your future success in business — your Technical notes are appreciated at present, and my only complaint about them is that they do not come out often enough.
—W.J.C.

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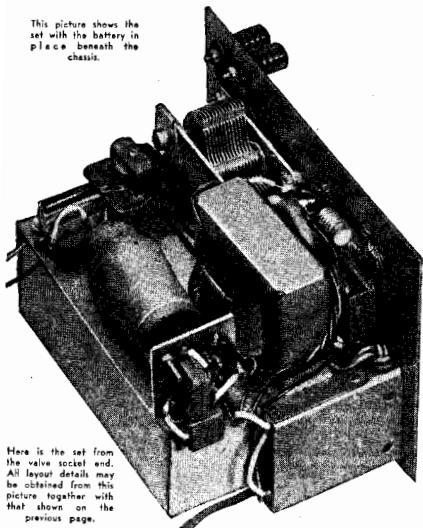
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This picture shows the set with the battery in place beneath the chassis.



Here is the set from the valve socket end. All layout details may be obtained from this picture together with that shown on the previous page.

tion being used to break the mains supply to the filament transformer, and the other section to break the earth connection for the reaction potentiometer. With most coils, reaction control will not be sufficient if the potentiometer is used merely as a variable resistance, which means that you will not be able to stop the set from oscillating, even with the control turned right off. When used as a potentiometer, there will be a steady, although very small, drain on the B battery even when the set is turned off, unless this double switch is used to break the circuit.

INDICATOR LIGHT

The indicator light is not a necessity, but we strongly advise you to use it, for obvious reasons. The indicator lamp is wired to the filament circuit, and an ordinary six-volt dial lamp is used. It is supported in a small holder of a type easily obtainable, or robbed from an old tuning dial. One of its connections is soldered direct to the earthed lug of the potentiometer, and the other to the "hot" side of the filament. You will be able to support it quite nicely so that the lamp comes opposite the bezel.

All the other parts are standard components, and hardly call for further comment.

The chassis is a very simple affair, and consists of a piece of scrap aluminium bent in the form of a shallow "U" so that it sits over the top of the B battery. As all wiring is made above the chassis, there will be a snug compartment in the cabinet for the battery when the set is mounted in place.

VALVE MOUNTING

One corner of the chassis is bent upwards to form a bracket for the valve socket, for which the necessary hole must be cut or punched. The top of the chassis measures 4 inches by 6½ inches, the turned-over side being 2 inches deep. The valve-socket support is 1½ inches square, and the chassis end is, of course, reduced by that amount unless you make a separate bracket for the socket and bolt it to the chassis. There is no need to do this, however, unless it happens to be more convenient.

The front panel is also made of aluminium, and ours measures 7 by 5 1-8 inches. It is bolted to the chassis by a couple of brackets bent up from the aluminium.

When the set is mounted and wired, the B battery is placed in the cabinet first and the set merely slid over it. You will find that the measurements given will allow plenty of clearance for the battery,



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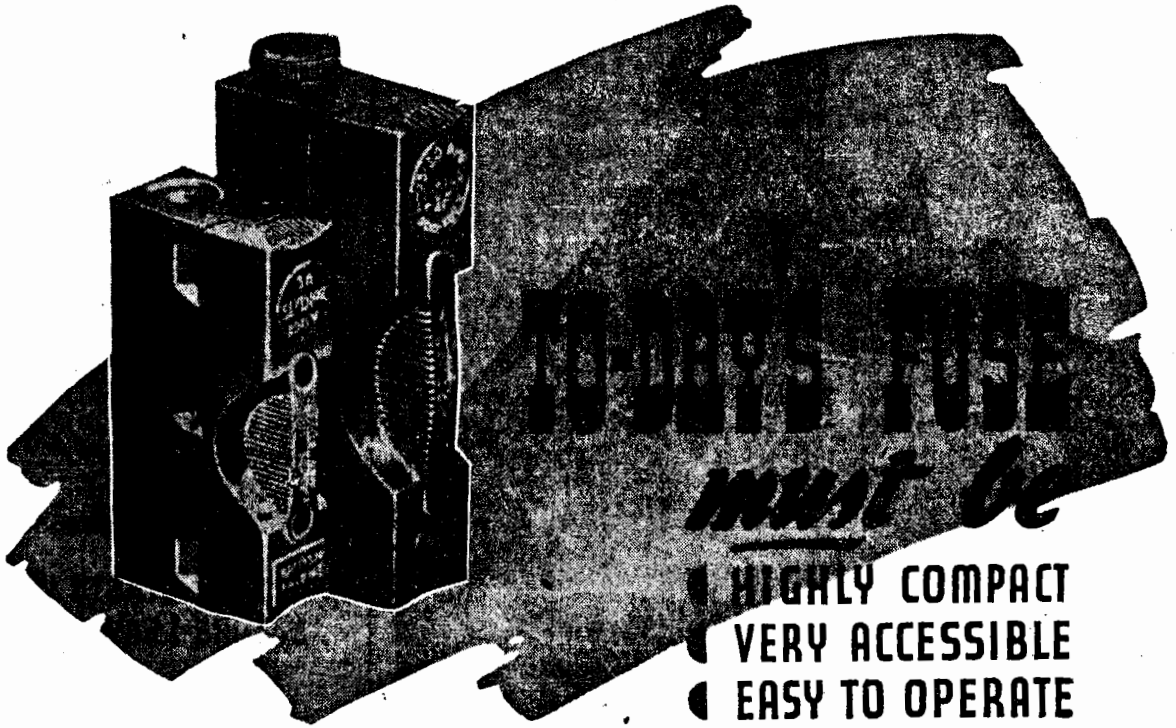
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without being too sloppy. The set was, in fact, built with the battery measurement as its base, and made only so much larger as would allow all the bits and pieces to be fitted into place.

CONTROL HOLES

The holes for the two controls are $1\frac{1}{2}$ inches from the top of the panel. The tuning condenser is 2 inches from the right-hand side, and the reaction control 4 inches from the same side. The bezel and switch are 1 3-8 inches in from the left-hand side, and are 7-8 inch apart. The headphone terminals are, of course, in the top right-hand corner of the panel.

To add to the value of the set as a Test Match Special, we made up a small metal bracket, also from aluminium, which is bolted to the panel below the controls. It has turned-over sides and bottom edge to allow a small card to be slipped into place and held there by the turnovers. On this card is an elementary "scoreboard" which allows a record to be kept of the innings being played and the batsmen's scores.

The photograph of the set shows one of these cards with a sample team printed in ready for the start. The cards normally will carry no names, as the team will, of course, vary from match to match. When the innings is completed, the card is slipped out and a new one substituted.

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This is a simple feature which we think will appeal to hundreds who will build the set. For this reason, we are having a number of cards printed, measuring 2 3-8 by 5 7-8 inches, which you can obtain from us in sets of 24 for 1/- per set. Even when the Test Matches are over, these cards will be useful for other matches, or for race results if you use the set for this purpose, as many undoubtedly will.

The card-holder is quite easy to make. First cut a piece of aluminium or tinfoil one-quarter of an inch larger on three sides than the card size. Mark off the flanges which are to be turned over, making the plate area 1-16 inch larger than the card size to allow for shrinkage when bending.

If you have a vise, bend each of the flanges over at a right-angle, having first cut 45-degree nicks out of the two corners. If you place a steel rule, or some other equivalent thickness of metal, against the plate itself, you can tap the flanges over with a hammer or mallet, leaving them spaced away from the plate by the thickness of your improvised "gauge." The result is a neat little card-holder which is then bolted to the front panel with countersunk 1-8 inch bolts.

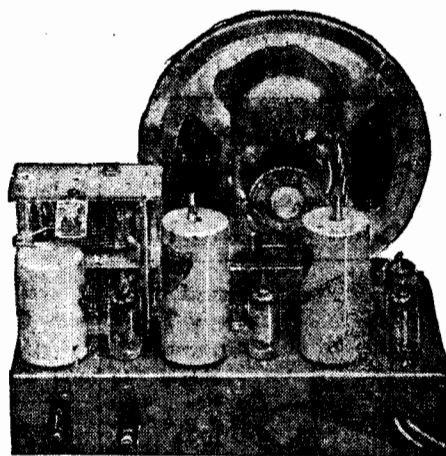
The card is inserted by springing it from the ends, inserting into the sides of the holder, and pushing downwards into place.

(Continued on Page 81)

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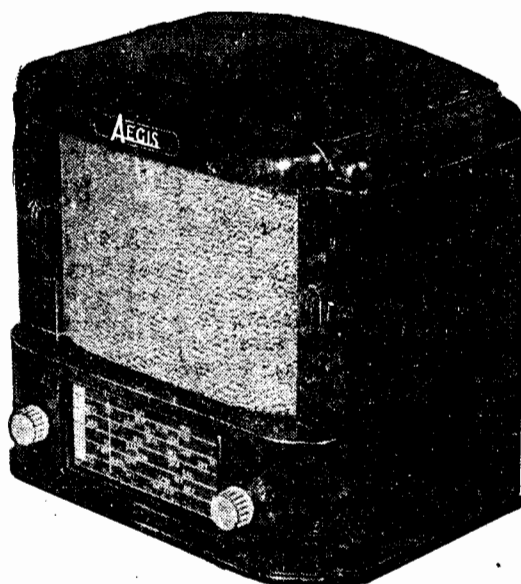


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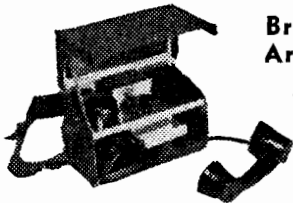
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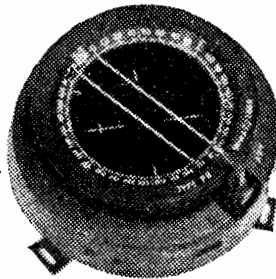
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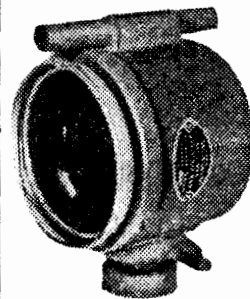
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FROM THE SERVICEMAN WHO TELLS

I WAS sitting quietly in the train the other day reading a radio magazine when the chap next to me began to regale me with an unsought account of his long-standing interest in the subject. Just when I was beginning to resent most his intrusion in my train of thought, he mentioned having a large imported receiver, "which has tuned stations from all over the world"—"a beautiful set—cost me a hundred guineas, but far better than any of the local trash." There was a lot more in similar strain.

Quite apart from the business angle, I am sufficient a radio enthusiast to be impressed by some of the expensive overseas receivers, and I began rather to envy the owner of this apparently magnificent receiver. Then came the pay-off—"yes, push-pull 71A's and 26's—six of them—and a 280 rectifier."

OLD SETS

How well I remember the general type of receiver, if not the particular model! They caused quite a sensation in their day, with a string of neutralised RF stages, no reaction, built-in power supply, and the last word in cone speakers. But, for all that, most of them had an intolerable hum, even by not-too-modern standards. I am old enough to remember that much.

But this chap was completely sold on his receiver, and oblivious of the fact that it was now 20 years out of date. He assured me again that he would not part with it at any price or swap it for the best of the modern sets.

I am afraid, at this point in the conversation, that I took the first opportunity of transferring my attention back to the technical manual.

Like most other servicemen, I have met the circumstance, dozens of times, of owners who will hear nothing against a set which sounds atrocious to anyone else. They are quite oblivious to the complete lack of bass response, the peaky treble, the high distortion, high hum level, and all the other features which characterised sets of the nineteen-twenties.

DISTORTION

Electrically it is impossible to make a case for these old receivers, or at least those which used audio transformers and cone or horn speakers. Most of the old audio transformers had a frequency response curve reminding one more than anything else of a low "Q" tuned circuit. At 100 cycles they were each anything up to 20 decibels down, and showed similar loss at the treble end. They could handle only a few volts of signal properly and, at the signal level required to excite old-style valves, their distortion content was terrific.

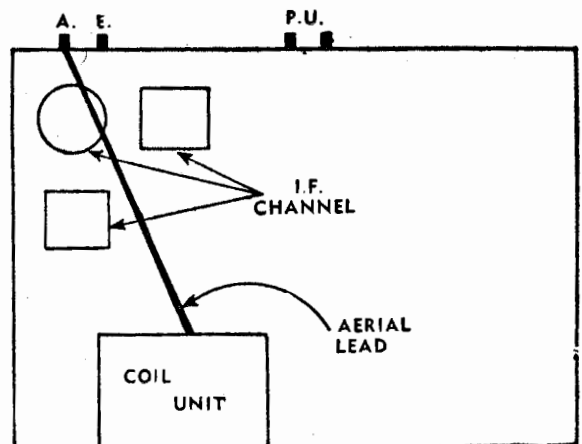
It is strange how some folk develop such a strong attachment for an old receiver. They will spend pounds to keep it in order and go to no end of trouble to locate replacements for obsolete valves. It is often worth more than one's good name to suggest kindly that the set has "had it" and should be pensioned off in favor of a new one.

The valves themselves were inefficient by modern standards, and they added another big quota of distortion in their attempt to get sufficient listening level from the loud-speaker.

Last, but not least, horn speakers or un-baffled cone type could not reproduce anything in the bass register and exhibited atrocious peaks in the middle range.

I am not saying these things to ridicule designers of that period. As pioneers they did a sterling job, but the art had simply not advanced sufficiently to make possible the results which can be

Showing how instability was caused by bad placing of the aerial lead.



achieved today. Their receivers may have been "clear" in the same way that a good telephone is clear, but any illusions one might have of fidelity is all "hooley"—to resort to the vernacular.

In all fairness I must make two qualifying statements. In the first place, the present generation insists on operating the domestic receiver with the tone control in the full bass position. Music becomes a succession of bumps and thumps, and male announcers appear to be saying their piece through a very thick felt hat. This may be all right for the younger generation, with their full faculties, but it is hardly fair on Grandpa, whose ageing eardrums are already many decibels down in the treble. What might sound quite intelligible to you may be to him a meaningless series of "woof woofs." Can we blame him if he prefers some other set with a peaky response which does, however, sound intelligible to his ageing ears?

T.R.F. SETS

The other point is that a few of the receivers manufactured just after the release of dynamic speakers were—and still are—very good from a tonal point of view. They had a TRF tuner, which did not cut the side bands too badly, a triode valve ensuring low distortion, and a dynamic speaker—some of the early ones being very good at room volume.

But these sets are hardly in the class, of which I first spoke, with the 26's and the old cone speaker.

* * *

Last week a chap came into the service shop with the request that I

align a receiver which he had just finished. It happened to be the Radio and Hobbies "1946 Advance." The set was said to be operating but, as it was his first serious attempt at set construction, I was expecting a rather "haywire" chassis.

When it ultimately arrived I was indeed surprised, for the wiring was not far short of commercial standards. All the important leads were run direct, the others being neatly squared. Many of the small components were mounted on a bakelite panel, the others being soldered neatly and rigidly in position. Apparently the constructor had spent some time previously in reading articles on the subject and had acquainted himself with the way in which commercial sets are wired.

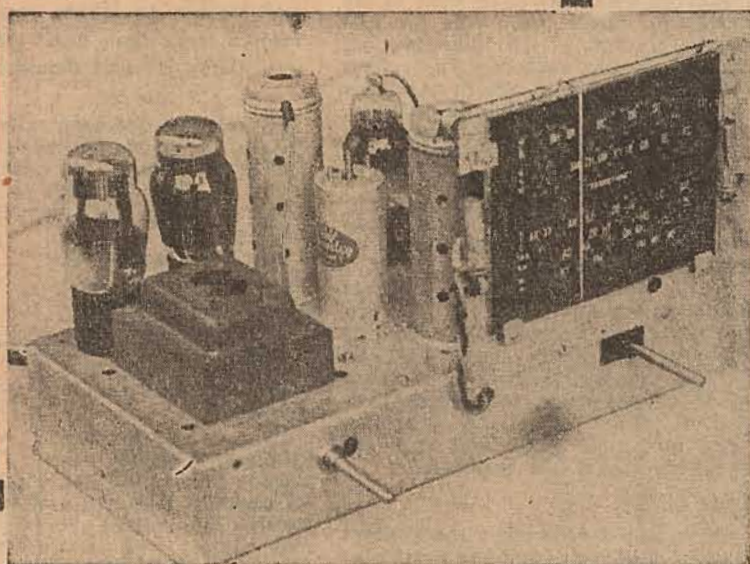
INSTABILITY

On test, the receiver put up quite a fair performance, as he had roughly aligned it according to the published instructions. However, there was a definite tendency to instability, which was only removed by operating with a large aerial.

To locate the trouble I connected the set to a shorter aerial, allowing it to operate on the verge of oscillation. Then, with one hand on the chassis, I brought the other hand near the IF amplifier socket and found the tendency to instability greatly diminished. The most likely cause of the trouble was the proxi-

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mity of the aerial lead to the IF amplifier socket, and it was the work of a moment to lift the lead wire off the terminal and loop it out over the edge of the chassis. Sure enough the tendency to instability completely disappeared.

I know I will be asking for a fight with the technical editor and many other set designers, because the aerial terminal is often located for convenience in the corner of the chassis near the IF amplifier socket. It had caused trouble in this particular receiver because the constructor had included the IF amplifier valve with rather more gain than normal, and also allowed the aerial lead to droop closer than necessary to the socket.

I suggested, therefore, that he transfer the aerial lead to the centre terminals, using the pair of terminals at the end of the chassis for pick-up connection. Of course, the best idea of all is to mount the aerial terminal on the end of the chassis adjacent to the coil unit, but it is often inaccessible in this position when the chassis is installed in a cabinet.

DEAD SET

Another 4/5 receiver, which I had occasion to handle came in with the report that it had suddenly gone dead.

Suspecting a breakdown on the B-plus line, I checked this first with an ohmmeter but, finding no short circuit, proceeded to couple the receiver to loudspeaker and power mains.

Just in passing, this set had a 5-pin speaker plug, which was wired in a rather unusual fashion, intended, among other things, to protect the filter condensers if the power were turned on without having the speaker connected. It is quite a good scheme, of course, and presents no particular worry when the socket wiring can be accommodated by arranging suitably a system of plugs on the test loudspeaker.

However, there are plenty of servicemen who go on for years using a nondescript collection of test loudspeakers, fitted with a variety of transformers, fields, and plugs. In nine cases out of ten, the speaker socket wiring is standardised, but, every now and again, it is necessary to spend several minutes rearranging a plug to suit a particular chassis, after which it has to be changed back to the more usual connection. Quite apart from the waste of time and the untidiness of the method, it is impracticable to have the speakers properly baffled, so that they tend to lie around among other items on the bench, and are forever in the way.

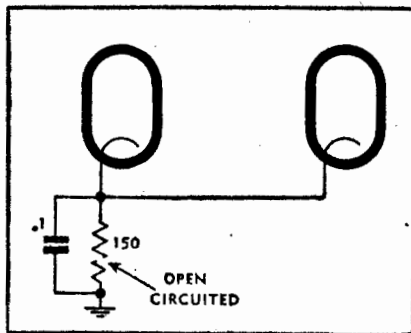
TEST SPEAKER

Against this, it is only a couple of evenings' work to build up a universal test loudspeaker, like the one described in the January, 1947, issue, which will thereafter accommodate any set one likes to imagine. It is not difficult, as an added refinement, to have three or four sockets on the panel with standard wiring and suitable cables, so that one is ex-

cused even the trouble of setting up the wander plug system for the more usual connections.

To get back to the receiver in question, I switched it on, and was greeted by the faint hum which indicated that at least the audio system was alive. A healthy screech when I touched the grid cap of the audio stage confirmed this observation.

Turning up the chassis, I found



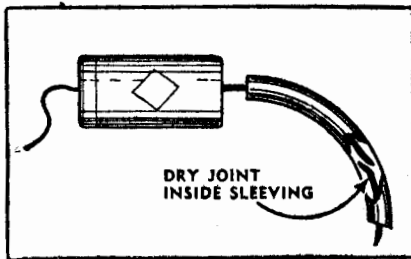
An open-circuited bias resistor stopped this set.

the high tension voltage to be on the high side, likewise the screen voltage on the converter and I.F. amplifier. Apparently these valves were not drawing their full current, so that the next check was on the cathode voltage.

This actually measured close on 100 volts, indicating that the d-c path from cathodes to earth was open circuited, and that I was actually measuring the voltage developed across the meter circuit itself. Quite obviously the bias resistor was open circuited, and it was a simple matter to replace this with another one of 150 ohms, to suit the particular pair of valves.

SOLDERING

Dry joints—and I don't mean private hotels—are always a good source of income for radio servicemen. The remark is prompted by a service call involving two distinct receivers in the one establishment, and in each case a dry joint was the cause of the trouble.



Dry joints are bad things, particularly when hidden by sleeving.

The first receiver was a rather large one, which was operating normally on pickup, but would not receive any stations. A quick check with a meter showed a voltage on all plates, but none on the screen and oscillator anode. At first I suspected the clips on the voltage divider or an open circuited divider, but it turned out that neither was the case.

In this set, the positive end of the voltage divider had been used as an anchor point for much of the high tension wiring, including the 0.1 mfd R.F. bypass, and a replacement 8 mfd final filter condenser. These leads, together with all the other wires and the solder, made a rather large blob, which had come adrift from the metal lug of the divider. As a matter of fact, it appeared that the divider lug had been heavily, but not very effectively, plated, and that the solder was adhering to the plating rather than the base metal. Vibration had been sufficient to separate the plating from the base metal, so that the whole blob of solder, with the included leads, was floating about 1/64th inch away from the end of the divider.

RIGHT HEAT

One couldn't lay the blame fully on the person who wired or serviced the receiver, but it is fairly safe to say that, if he had used just a little more flux and a little more heat, the solder may have penetrated the thin layer of plating and amalgamated with the base metal more effectively.

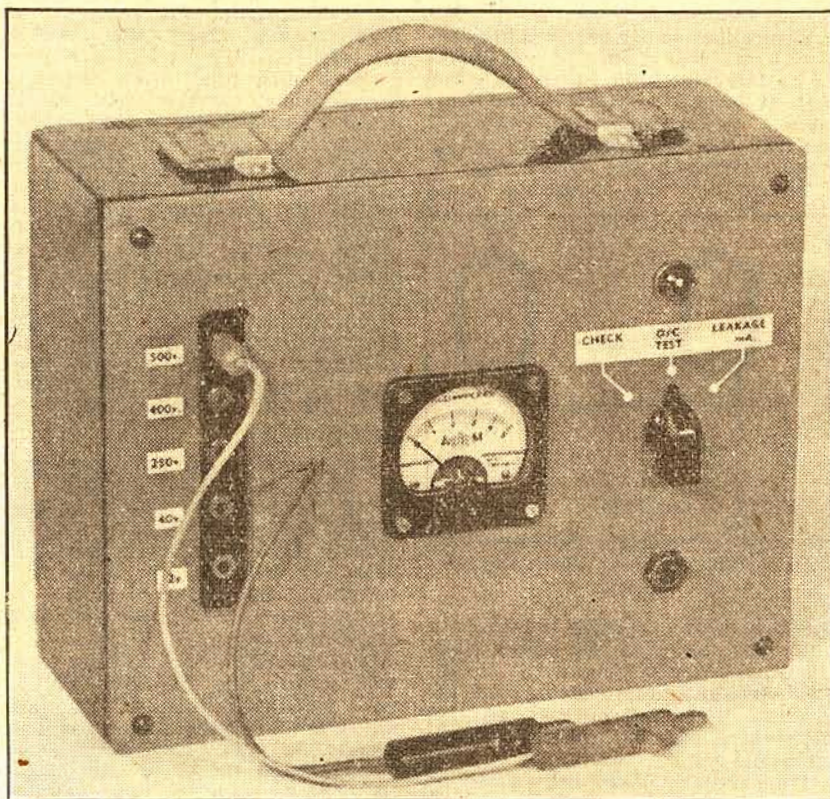
Actually, the art of making a good solder joint lies in using just the right amount of heat and neither too much nor too little flux. Too much flux is likely to cause corrosion and losses, while too little will lead to the effects such as the one mentioned.

Incidentally, when I ultimately got this receiver into operation, I found that the broadcast alignment was way off the mark, 2FC just managing to scramble in at the extreme low frequency end of the band. Though they stoutly denied all knowledge of it, someone in the household had obviously been tightening up screws in an attempt to get the receiver back into operation. Ah, well . . . !

DRY JOINT

In the same household another midget receiver would operate only when turned on its side, and that was just how I found it. It took me quite a few minutes of prodding and pushing of the components to find the intermittent connection, but it ultimately turned out to be a dry joint inside a short length of spaghetti tubing. The pigtail of the grid coupling condenser to the last valve was apparently 1/4 in. short, so that the wirer had joined to it a short length of tinned copper wire and slipped a length of spaghetti tubing over the whole lead. When the other end of the lead had subsequently been connected to the socket, the heat had affected the joint inside the spaghetti tubing, so that it ultimately came adrift. If you have to extend the lead to a resistor or condenser, it is better to snip the original pigtail back, so that the junction is further away from the end connection. Better still, twist the leads together over a short distance, so that there is a mechanical as well as a soldered joint.

But, as I said before, why should I worry? I am a radio serviceman, and they gave me tea and toast, in addition to my fee.



The tester can be built into a handy case for use in the lab. or workshop.

ily enough by an ordinary ohmmeter check, but a condenser which is just doubtful may not be detected owing to the limited sensitivity and the absence of strain on the dielectric.

Unless otherwise indicated, air and mica dielectric condensers can be tested at 400-odd volts, and should show no measurable leakage on an ordinary milliammeter. If there is a reading, repair or replacement is indicated, according to the type of unit.

COMPARISONS

The leakage with paper condensers, as measured on laboratory equipment, is higher than air or mica dielectric types, owing to their normally greater capacitance and the characteristics of the paper itself. Even so, a good condenser will show no measurable leakage on an ordinary milliammeter at full rated voltage, and one which does deflect the pointer should be treated with suspicion. The leakage with higher capacitance values is naturally more noticeable, but the chances of breakdown in a receiver depend largely on the voltage to

SIMPLE CONDENSER TESTER

Here is a suggestion to make life a little more simple for the radio serviceman—a device which will indicate the general condition of any ordinary fixed condenser, and simultaneously apply to it a voltage near its working limit. The construction of the instrument requires, for the most part, only oddment components and a couple of evening's work.

LEAVING aside laboratory measurements and equipment, the measurement of leakage current with the full rated working voltage applied is probably the simplest means of indicating the general condition of a condenser. At least, it tells the serviceman whether there is a troublesome leakage and whether the condenser is likely to break down in the near future — the point in which he is most interested.

TESTING METHODS

One may add, of course, that it is helpful to know the exact capacitance, but equipment to apply a simultaneous leakage and capacitance test is necessarily more elaborate than we have in mind at the moment.

One testing method involves, for example, charging condensers to a specified voltage and measuring their discharge current after a prescribed time. A good scheme, no doubt, if you have plenty of time, patience and equipment. Another idea is to measure voltage or current in the condenser under test with an a-c or audio supply. Once again, this brings

problems in its train, not the least of which is the distinction between leakage and reactance.

Our own instrument takes the form essentially of a d-c power supply giving a selection of test voltages across which the condenser can be connected. Leakage is indicated directly on a meter.

The leakage current is a function of the actual d-c resistance between the two "plates," and, therefore, it is a function of the insulating properties of the dielectric material.

A perfect condenser is one having no leakage at all, and, while perfection in such matters is never attained, the leakage current through a good condenser is very small indeed.

A broken-down condenser, or a very poor one can be picked out eas-

which the condenser is subjected.

Electrolytic condensers are in a class by themselves, the dielectric being formed by chemical action and maintained in service by the potential difference across the condenser. A certain amount of leakage is normal, depending on the capacitance, the voltage rating, and so on.

Manufacturers have set down permissible limits for this leakage resistance in terms of ma. of current per mfd. of capacitance. The limits vary according to manufacture both in this country and in America. It therefore becomes necessary to strike an average for the various sizes. The circuit application of a condenser will determine whether leakage is important and, in a borderline case, this should be the governing factor in rejecting or retaining a doubtful condenser.

LIMITS

In the 525 and 40 peak volts series, the limits are fairly well defined. The permissible leakage for high capacitance 12 PV types is subject to wide variation but, fortunately, these are not so widely used.

A point to bear in mind is that these limits apply after a minimum charging time of three minutes. In cases where the electrolytic has not been in use for some time, a much greater time lapse will be necessary before

by *Raymond Howe*

CIRCUIT OF LEAKAGE TESTER

the leakage current settles down to a steady minimum value.

The accompanying chart shows how these limits work out for the conventional sizes of electrolytic capacitors. For convenience, a copy of this chart could be attached to the front panel of the tester.

In the case of the high capacity electrolytics, such as the 100 and 500 mfd. 12 PV type, the limits vary considerably, but more of this anon.

It will readily be seen from the circuit diagram that a d-c source with suitable tapplings has been arranged so that, with appropriate switching, three tests may be carried out on almost any size and rating of capacitor used in radio sets and "ham" transmitters. In the latter case, tests on the higher voltage filter capacitors and RF bypass condensers can still be of interest, even though the voltage applied may only be about half the working voltage.

TEST VOLTAGE

Apart from its bearing on actual breakdown, leakage is important where capacitors are used in high impedance circuits such as, for instance, the grid and AVC networks in a receiver.

To provide the necessary test voltage a power transformer with a 385 volt secondary is used. A 350-volt secondary would do, but nothing lower if you want to have the benefit of the 500-volt test point.

The highest voltage test point was set at 500 volts, as this is quite satisfactory for both 525 volt and the 600 volt electrolytics. The extra 20 odds volts in the case of the former would not increase the leakage current by any noticeable amount. By the same token, if a 600 volt type does not pass the leakage test under a 500 volt stress then the condition for 600 peak volt operation can certainly be considered as unsatisfactory.

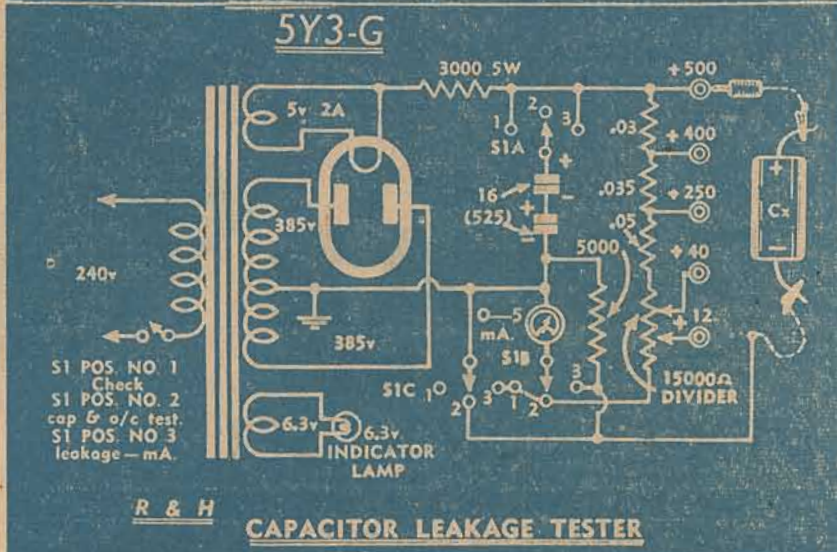
Of course, if one likes to test the 600-volt type under a peak voltage stress of about 550 volts, it is a simple matter to arrange a switch to short out the 3000 ohm dropping resistor so that the full peak voltage of a 385 volt secondary winding may be realised for the test.

LOAD CURRENT

With the total value of the bleed resistance shown, the load current will be approximately 3.35 mA. The actual load current is not important, provided that it gives a satisfactory initial reading on the meter.

The bleed resistance is made up preferably of 2-watt resistors of the values shown, and a 15,000 ohm voltage divider. This divider is inserted so that the 40 and 12 volt test positions may be obtained easily. It is just as well to keep the voltages at these test points at a little on the low side, as electrolytics of these ratings are not usually called upon to function at their maximum voltage ratings.

The resistor in series with the capacitor under test is there to limit the current in case it develops an internal short-circuit.



The circuit is essentially simple and tells you all you need to know.

The 0-5 mA meter was selected mainly because it is of a size which is—or has been—readily available through Disposals' sources and because the desired current readings are within the 5 mA range.

The rectifier valve may be of any suitable type, which may be on hand. With a working current of only a few mA, rectifier impedance will not govern the output voltage to any great extent, and it matters little if the rectifier reads "Doubtful" on the valve tester.

SWITCHING

The filter capacitor is made up of two 16mfd. or 8mfd. 525 PV units connected in series. This capacitor, in being charged to the peak voltage by the rectifier becomes, in effect, the source of supply for the tests.

The functioning of the three by three switch is as follows: In position 1 the filter capacitor is in circuit, and the meter is connected in series with the bleed resistance. The meter reads the current through the bleed at a potential of around 500 volts.

This position is labelled "Check." When a capacitor, say an 8 mfd. 525 PV type, is connected between the common and plus 500 volt test point, current will flow through this capacitor and the series resistor. This action will reduce the current

through the bleed resistance, as read on the meter, because a parallel path has been set up.

As the charge builds up across the test capacitor, the current flow will decrease through this branch, and allow the meter reading to increase towards the reference point. Just how close this reading approaches the reference point is in itself a rough check on the condition of the test capacitor, Cx. Charging current or breakdown cannot damage the meter and the operator can judge whether it is safe to proceed with a leakage test.

Position 2 of the selector switch leaves the meter connected in series with the bleed resistance, but removes the filter capacitor from circuit. With no test capacitor connected, the meter will now read somewhere between 2 and 3 mA. The reason for this is that, without the storing action of the filter capacitor, the d-c voltage across the bleed resistance drops to approximately the RMS voltage of the power transformer.

Position 2 of the switch also arranges for the test capacitor to be connected as a filter in lieu of the main filter, which is out of circuit.

If Cx is in good condition, the meter should read very much the same as when in position 1. If, on the other hand, Cx is open-circuited,

(Continued on Page 87)

PARTS LIST

- 1 Suitable carrying case.
- 1 Power transformer, 385 v. a side, 5v. 2A., 6.3 v.
- 1 Rectifier valve 5Y3GT, 80 (or similar).
- 1 On/off switch.
- 1 0-5 mA. meter.
- 1 3-circuit 3-position wafer switch (preferably 2-bank).
- 2 16 mfd. 525 P.V. electrolytics.

RESISTORS

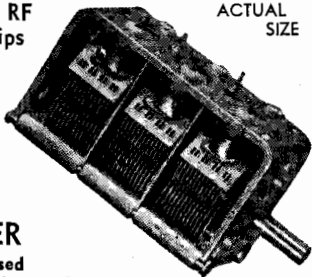
- 1 .05 meg., 1 .035 meg., 1 .03 meg., 1 5000 ohm.
- 1 3000 ohm 5W., 1 15,000 ohm voltage divider.

SUNDRIES

- 1 Indicator lamp holder with 6.3 v. lamp, 6 banana plug sockets, 1 banana plug, 2 insulation covered instrument clips, 1 pointer knob, wire, nuts and bolts, etc.

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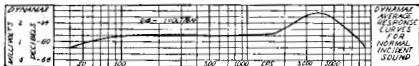
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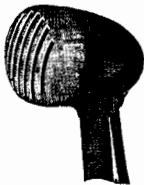
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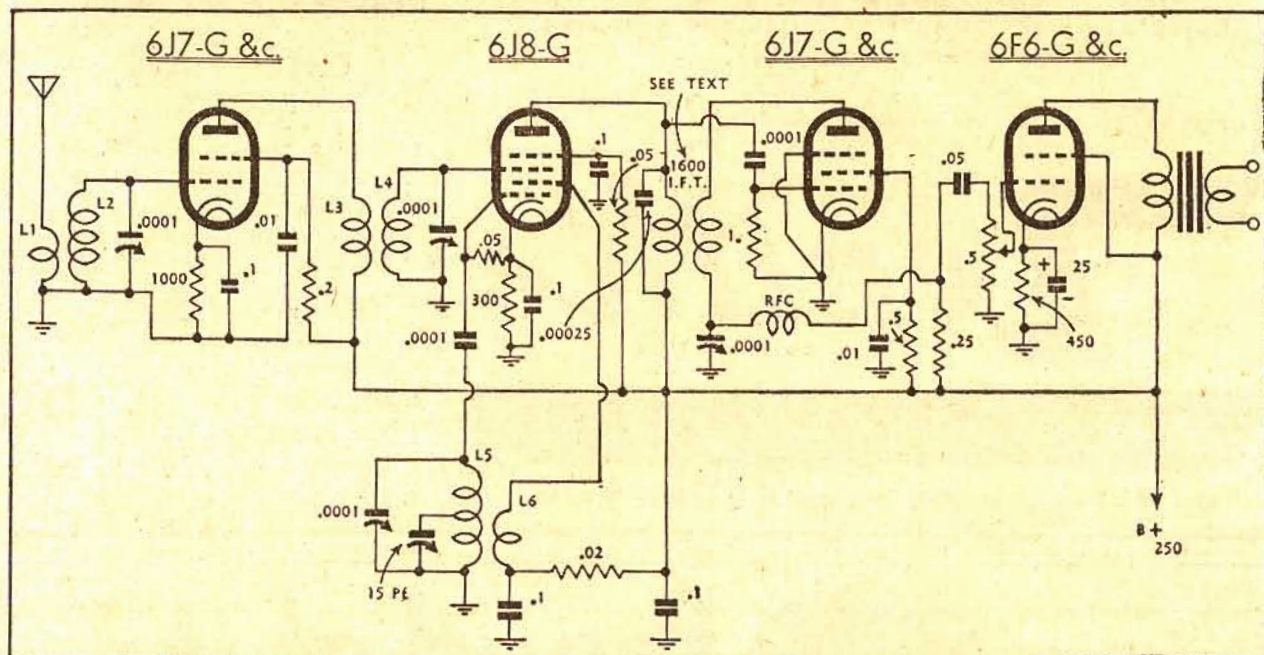
And at 367 KENT STREET, SYDNEY MA2588, M3136



A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

NOVEL SUPERHET USES REGENERATIVE I.F. CHANNEL



From Mr. B. S. Clarke, of Edwardstown, SA, comes this design for a "standby" amateur superhet. Although not suggested as a top-line communications receiver, Mr. Clarke claims that it gives a degree of gain and selectivity well in excess of that to be expected from a T.R.F. design.

THE design calls for no expensive parts and most enthusiasts will be able to "scrounge" sufficient parts to build it up. Even if the circuit is not followed in detail it will provide food for thought for experimenters.

There is a conventional R.F. stage which can use any R.F. pentode, variable-mu or otherwise. Gain control for the R.F. amplifier is an optional feature, depending on the signal strengths likely to be encountered in the particular location.

For the converter stage, a 6J8-G is suggested, although any other converter valve will serve, provided suitable adjustment is made to the operating conditions.

Coil data is given for three bands. It will be noted that the same coil is specified for the oscillator on 7 and 14 Mc., the reason being that the oscillator can be operated on the high side of the signal at 7 Mc., and on the low side at 14 Mc. However, there is no reason why a third oscillator coil should not be provided, if desired.

Chief point of interest in the circuit centres in the I.F. channel, which

takes the form of a single transformer feeding a regenerative detector. In the original set, this was constructed by stripping a commercial short-wave coil, with $\frac{3}{4}$ inch former and variable iron slug. The tuned winding consists of 55 turns of 32 gauge enamelled wire, while the primary is 18 turns of the same gauge wire, spaced 1/8th. inch away.

The feedback winding will need to be correctly phased in the circuit to produce oscillation. Any tendency for the feedback to be "ploppy" in its action, or difficult to control can generally be corrected by reducing the coupling between windings. (Alternatively, it should be possible to use a normal "reinartz" coil in this

position, with a conventional reaction circuit . . . Ed.)

Since the intermediate frequency remains constant at about 1600 kc., the reaction adjustment is more or less independent of tuning and, of course, there is no danger of radiation when the receiver is oscillating.

In the interests of stability, it is desirable to shield the R.F. converter and I.F. amplifier circuits and to select a layout which will make possible short leads in the R.F. section.

Although a 6C6 is suggested as the detector, any other R.F. pentode may be used or even a triode, if some loss of gain is tolerated. There is a similar latitude in the choice of output valve.

No power supply is shown, but this can be any conventional arrangement which will give an output of about 250 volts at 40 odd milliamps. (From B. S. Clarke, 5 Karong-avenue, Sth. Edwardstown, S.A.).

COIL DATA

Band	L1, L3	L2, L4	L5	L6	$1\frac{1}{4}$ " diam. formers 24g. or heavier.
3.5 Mc.	8t.	32t.	7t.	18t.	
7.0 Mc.	7t.	18t.	7t.	12t.	
14 Mc.	7t.	10t.	7t.	12t.	

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OVER A WIDE RANGE

WITH THE

CALSTAN

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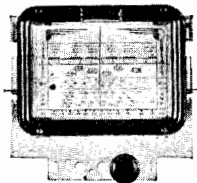
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Dimensions are 7" x
6½".



THE EFCO

MANUFACTURING CO. LTD. ARNCLIFFE, N.S.W.



BUILDING AN ABSORPTION METER

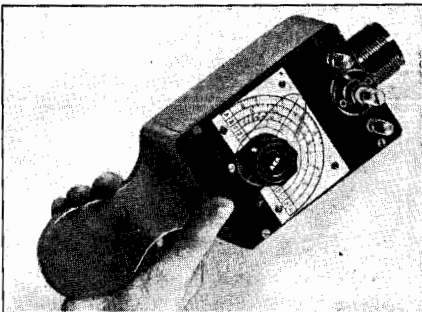
AN absorption wavemeter consists essentially of a coil, a variable condenser and a torch globe, all connected in series. Alternatively, it can be regarded as a parallel tuned circuit with a torch globe connected in one leg to indicate the flow of radio-frequency current.

The application in a "ham" shack is equally simple. The coil in the wavemeter is held close to the plate tank coil of an RF amplifier or oscillator and the wavemeter condenser is varied throughout its range. As the wavemeter tunes across the frequency at which the plate tank is excited, the torch lamp will light to indicate resonance.

LAMP INDICATOR

The energy in the plate circuit of an ordinary crystal oscillator is adequate to light a pea-lamp, while, for circuits handling greater power, the wavemeter must be held at a discreet distance to avoid burning the lamp out altogether.

The fact that a wavemeter relies for its operation on mutual coupling between the coils rules it out as a precision device, since even a small amount of coupling will react on the characteristics of both tuned circuits and lead to error. Its value, however, is not so much to indicate an exact figure as it is to indicate the order of frequency in a tuned circuit. It is, therefore, invaluable for identifying the various harmonics from an oscillator, amplifier or frequency multiplier stage.



Here is the wavemeter ready for action.

Though extremely simple in its construction and application, an absorption wavemeter is invaluable in any "ham" shack. This article tells you how to build and calibrate a wavemeter giving complete coverage from 3 to 55 megacycles.

In most transmitters, the frequency is governed initially by a quartz crystal or by some other device which, according to current regula-

tions must be capable of frequency calibration and stability equal to that of a crystal. However, this fundamental frequency is conventionally multiplied from 2 to 8 times, certain harmonics being picked off and amplified for radiation. The supreme tragedy in a ham shack is to mistake a harmonic to begin calling CQ on a frequency outside the allotted bands.

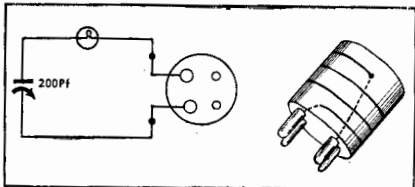
This is where the absorption wavemeter comes into its own. It will positively identify each harmonic, if calibrated properly, and will not respond to frequencies other than that to which it is tuned.

SIMPLE FORM

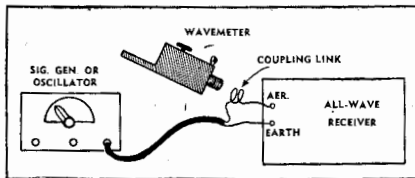
Absorption wavemeters can take many different forms, but the one suggested in this article has been found very convenient for general use in the ham shack.

The tuning condenser, complete with gear-reduction drive, was taken from an Army 108 transceiver and mounted on a small rectangle of bakelite measuring about 5in. x 3 1/2in. A flat brass washer was sweated to a part of the gear mechanism to replace the original calibrated scale. A celluloid cursor was bolted to this washer and so arranged that it described a 180 degree traverse over a cardboard scale. This scale was marked with four semi-circles, which were subsequently calibrated by a method to be described.

The condenser itself is one with nine full-sized plates giving an ap-



The circuit is simple and well known.



Showing how the wavemeter may be calibrated.

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proximate maximum capacitance of 200 mufd.

It is wired as shown to a lamp socket on the panel and also to a pair of terminals and to a four-pin socket mounting at the top of the case. The terminals are optional fittings and are there in case you may ever want to substitute a larger coil for greater sensitivity. In the normal way, the coils which form the basis of calibration are wound on four-pin valve bases and plug into the socket.

The accompanying table gives all necessary data for winding the coils, and it will be noted that there is complete coverage with the particular tuning condenser from 3 to 55 megaeyles.

CALIBRATION

The method of calibration evolved warrants special mention, as we have not actually seen it published elsewhere.

An all-band oscillator was set up, feeding into an all-wave receiver, which happened to be fitted with a signal-strength meter.

The "hot" side of the oscillator output was connected to the aerial terminal through a loop of from one to four turns bent up from a short length of heavy-gauge wire. Diameter of the loop was approximately 1 1/4 inches.

BAND	TURNS	GAUGE	WINDING
3-6	30	24 S.W.G.	Close wound
4-7	12	18 S.W.G.	Space to 1/4"
10-25	6	18 S.W.G.	Space to 1/2"
27-55	2	18 S.W.G.	Space to 5/8"

All coils wound on 4-pin 1 1/4" dia. valve base.

The method of calibration is to feed the oscillator into the receiver at known frequencies, adjusting the output to give noticeable deflection on the signal-strength meter. The wavemeter coil is then held close to the series loop and the wavemeter tuning varied until a flicker or dip is noticed in the reading of the signal-strength meter. When this occurs, the resonant frequency of the wavemeter will approximate the output frequency of the oscillator.

LINK TURNS

Some experiment may be necessary with the number of turns on the series link, the idea being to use the least number of turns and the least amount of coupling necessary to effect the signal-strength reading. By following this procedure, it is possible to calibrate the wavemeter over its entire range. Exact spot frequencies can be identified by causing the wavemeter to respond to various frequencies which may be available from the transmitter.

Even assuming that you go to some trouble in the construction of the wavemeter, it is only a night's work to complete the job, including the winding of coils. But it is well worth while to spend the following evening, while interest is keen, to obtain complete calibration. Once the job is done the wavemeter becomes a permanent part of the equipment in your shack, and will pay for itself many times over in time saved and in the positive way it identifies output frequencies.

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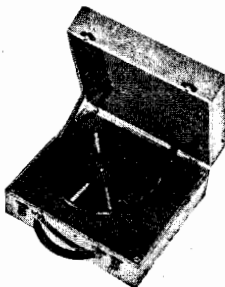
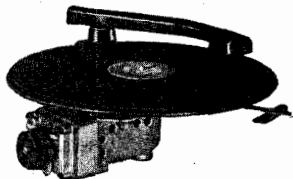
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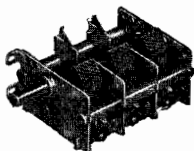
£9:6:6

Type S, GARRARD, 1 Speed. Motors as above,
£6/19/6.



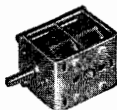
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Size 3 1/2 x 1 1/2 x 2 1/2



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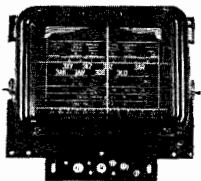
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2 pages.

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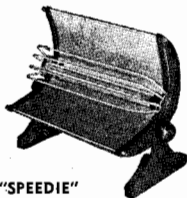
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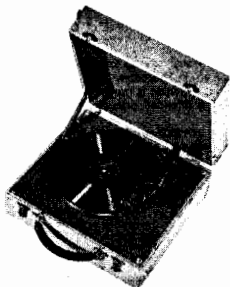
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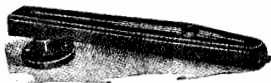
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- Full record frequency range;
- Low needle scratch level;
- 100 deg. Arm Swivel;
- Sturdy large size Crystal completely enclosed.
- Neat shape and smart finish.

Original Price 67/11

Our Bargain Price 45/6

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Loop Aerial Kingsley	6/8	Transformers 30	
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Osc Coils "Q" Plus	4/9	F.N.	19/6
R.C.S.	6/6	Sle Gang Condensers	
Kingsley	8/9	F.N.	12/6
Kingsley Air Coils	8/9	8 mfd Condensers	3/8
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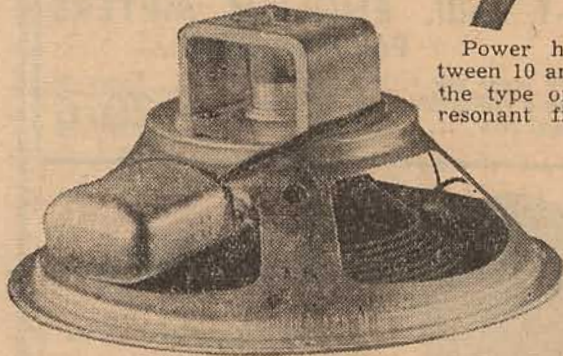
An "Acos" crystal speaker is announced by the Amplion Company, for use in bedrooms, hospital wards, or any other situation where individual listening is required. Taking the place of headphones, the Acos unit is intended primarily to be slipped beneath a pillow or cushion.

DESIGNATED as type RE1, the new pillow speaker has a diameter of 4 3-16 inches and is 1 1-16 inch thick at the centre. The finish is in black bakelite and a thin cord with plug attachment is provided for connection to the receiver.

The frequency response is peaked deliberately in the treble register in order to offset the losses occasioned by listening to it through a pillow.

The average power required is only 10 milliwatts, so that a receiver can operate up to 100 Acos units per watt of available output. Being a high impedance crystal device, the unit must be isolated from d-c by a coupling transformer or reliable blocking condensers.

As indicated by the power rating, the Acos pillow speaker is very sen-



Power handling capacity is between 10 and 20 watts, depending on the type of baffle, and the natural resonant frequency of the special Horley cone is in the vicinity of 70 c/s. Retail price of the AV36 loud-speaker is £4/3/8.

Supplies are normally available through Amplion distributors. Amplion (A'sia) Pty. Ltd. are at 36-40 Parramatta-road, Camperdown, NSW.

sitive and a quick check showed that it was feasible to operate it directly from the output of a tuner using a diode detector or a sensitive crystal set—in the latter case with somewhat reduced volume.

Retail price is £3/16/4.

12-INCH SPEAKER

Amplion also advise that reasonable stocks are available of their AV36 dynamic speaker. This 12-inch speaker has a 1 1/4-inch diameter voice coil with an impedance of 12.5 ohms at 400 c/s. A special Alnimax magnet gives a field density in the gap of 9000 gauss.

Mr. H. K. Love—Managing Director of Kingsley Radio, Pty. Ltd., Melbourne—announces that its General Manager—Mr. Lay W. Cranch—will be resident in Sydney for an indefinite period. Mr. Cranch will assist the Sydney trade both technically and commercially.

Mr. Cranch may be contacted at Kingsley's branch office, 17 Bond-street, Sydney—phone B1086.

Mullard Flash Tube LSD-3

FOLLOWING their release of the micro-second flash tube type LSD-2, Mullard Australia Pty. Ltd. now announce a second type, the LSD-3. Whereas the earlier tube was designed mainly for laboratory application, the LSD-3 is more suited for normal purposes of photography.

With an operating potential of approximately 2000 volts and a flash duration of between 100 and 200 microseconds, the LSD-3 is ideal for use in portable and studio type flash units, enabling photography of moving objects.

Characteristics reveal an operating voltage range of from 1000 to 2700 volts and a maximum energy discharge of 1000 joules. The tube is filled with pure Xenon gas and the color of illumination is specified as "northern daylight."

The tube has a straight-sided glass envelope, is 3 1/2 in. high, and has a base diameter of 1 1/4 in. A standard 4-pin UX base is fitted. In the normal way the necessary operating voltage is obtained from a spark coil, which is arranged to charge a condenser of specified value.



New Tool For Metal Workers



ONE of the handiest tools we have seen for a long time has been introduced recently to the market by Emm Yannoulatos (Overseas) Pty. Ltd., of Bull's Chambers, Martin-place, Sydney. Known as the "Aycut" saw, it will do many of the awkward jobs which a hacksaw cannot do because of the frame. The saw can be used with standard hacksaw blades and a spring-loaded guide, which rests normally against the face of the work, prevents the blade buckling under load. A Vauxhall product, the Aycut saw is to be distributed through all hardware and

country stores. Bulk and trade orders can be directed to Emm Yannoulatos Pty. Ltd. at the above address.

VARIABLE SELECTIVITY

COMMENTING on points raised in the "Fidelity Five" design, the Aegis Manufacturing Company advises that it has been marketing for some time a 485kc. I.F. transformer fitted with a tertiary winding. Known as type J-13, the transformers, as illustrated below, can be installed in any standard superhet. Instructions for installation are included in the carton. Although these particular transformers have not been tested as yet, the effect of the tertiary winding is normally very marked.

The Aegis Mfg. Co. also advises that it is producing 10.7 mc. transformers for use in F.M. receivers, a standard broad-band type being available and one intended for use with a ratio detector. These transformers have been designed in conjunction with the PMG Department.



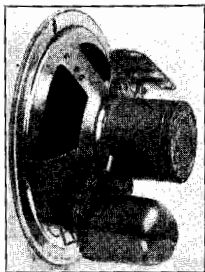
NEW ROLA 6-INCH SPEAKER

Latest release from the Rola factory is the model 6K loudspeaker, which is claimed to give an output 3db. greater than the earlier model 6H, by reason of an improved magnet. It is recommended for use in battery receivers or high quality a-c mantle receivers.

ALTHOUGH the actual lines per inch are not given for the field density in the gap, a very high figure is ensured by the use of an enlarged anisotropic alnico magnet. The effect is evident in the increased power sensitivity and improved response to transients. A figure of 3db. means double the acoustic power output for a given input.

Overall diameter of the diaphragm housing is 6-9/16 inches and diameter of the baffle opening 5 1/2 inches. Voice coil diameter is 1/2 inch and the natural cone resonance is in the range 110 to 120 cycles per second.

Type "D" isocore transformers are fitted as standard, a range of impedance values being available to suit the requirements of individual power valves. Power handling capacity is given as 6 watts, the exact figure, of course, depending on the nature of the baffle provided.



The new Rola 6K loudspeaker carries an isocore output transformer and is fitted with an angle bracket for mounting to the chassis.

HERE NOW! The lowest priced high quality crystal mike in Australia

Another ACOS triumph!

Ideal for hams. The "J7" gives crisp, clearcut, "DX quality" reproduction, to cut through the heaviest QRM. High frequencies peaked—high output—has built in load resistor.

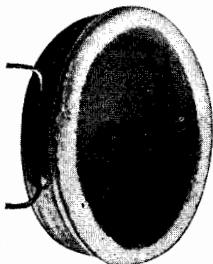
Public Address. Its excellent quality and high output makes the "J7" suitable for all P.A. installations—light and rugged—easily adapted for use as lapel mike.

Home Broadcasting. Because of its exceptionally high gain, the "J7" will give ample volume when plugged direct into the pick-up terminals of most good receivers. No preamplifiers or transformers required—a novice can install it.

Office and Factory Call Systems. With its accentuated "speech range," the "J7" is ideal for all paging systems.

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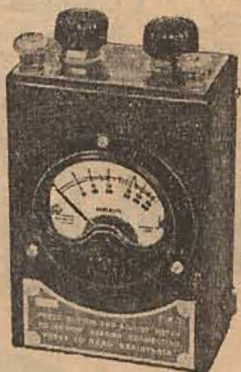
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Portable, light, sturdily constructed, the S.T.B. is a versatile postwar service instrument.

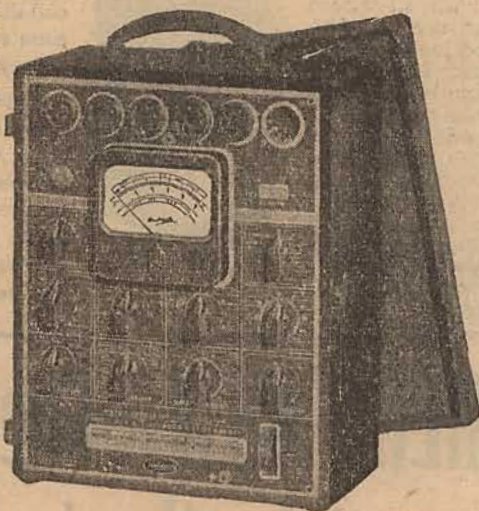
EARTH RESISTANCE TESTER

Designed for testing all types of electrical earthing systems, model E.X.T. finds a ready use in every electrical workshop. It is a three range ohm-meter dimensioned to fit your pocket. Ranges are 0-20 ohms, 0-500 ohms, and 0-5000 ohms. It will read down to .1 ohms and centre scale readings are 2 ohms, 70 ohms, 200 ohms.



SUPERTESTER

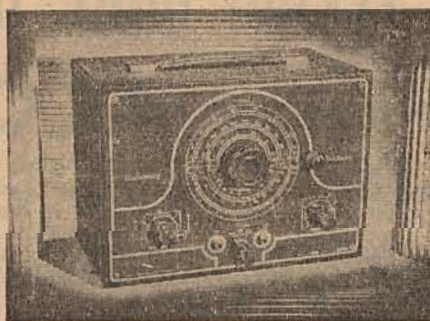
Model T.S.T. is a compact instrument combining the functions of a valve tester, multimeter, output meter, paper and mica condenser tester and electrolytic condenser tester, (providing both leakage and impedance tests). It features the time saving roller chart.



SERVICE OSCILLATOR

A.C. or Battery Operated.

Model X.O.A. (A.C. operated) or model X.O.B. (operated from internal batteries) service oscillator is an instrument designed to suit the requirements of the average radio serviceman. It is a comprehensive instrument with the advantage of being priced to meet the pocket of the service engineer. Frequency coverage 160 K.C.—32 megacycles in five bands. Unmodulated, modulated or audio output. Fixed modulation 400 cycles at 30% modulation. Calibrated capacity type piston attenuator.



UNIVERSAL SPEAKER AND OUTPUT METER

Model U.S.O. is an essential piece of equipment for the radio service bench. It consists of a special loudspeaker unit which by means of a multi-resistance field network and multi-impedance output transformer becomes suitable for operation with any type of receiver. A patching system allows any type of speaker plug or connection to be used easily and quickly. A calibrated output meter is built in and reads both decibels and watts. Ranges are 0-500 milliwatts, 0-5 watts and 0-50 watts.

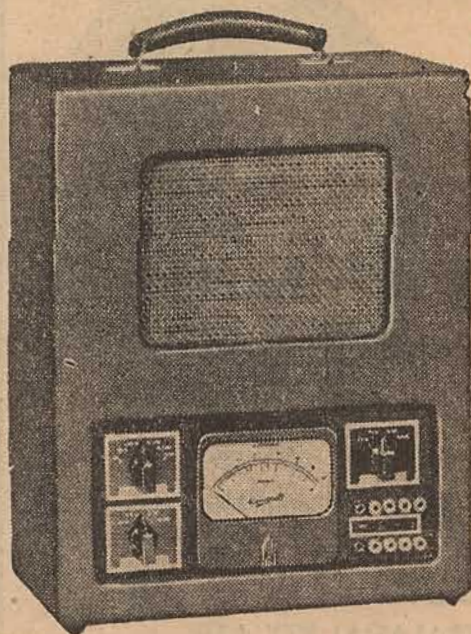
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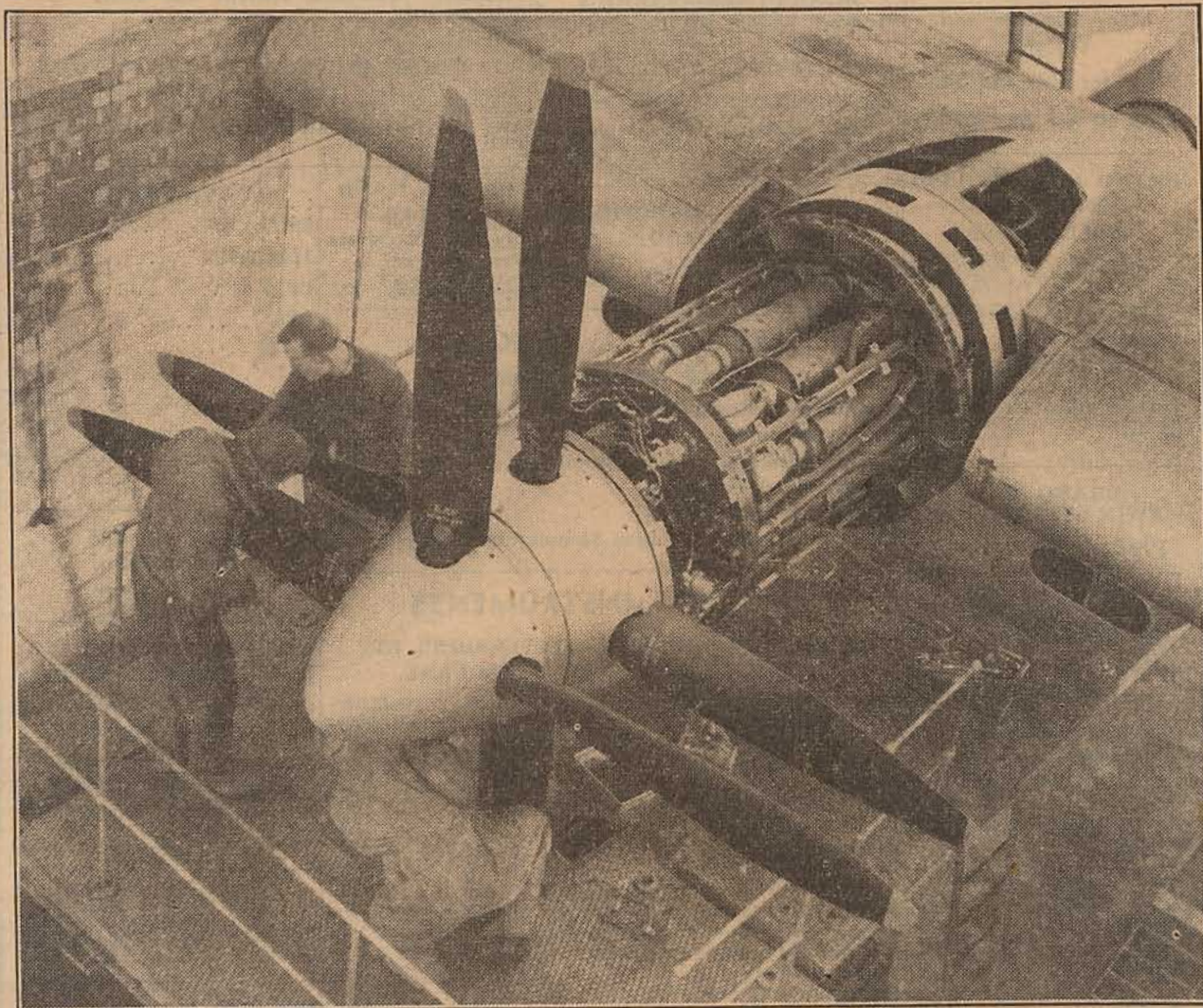
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THE NEW MAMBA GAS TURBINE PLANT



The Mamba engine fitted to a fuselage. It is remarkable for its small size compared with the power output available. Here it drives two four-bladed contra-rotating airscrews.

Last month we showed a picture of a Lancaster bomber fitted with a Mamba gas-turbine as a fifth engine for experimental purposes. In this article we give some actual details about the Mamba, as representing a new and valuable development in engine design.

THE Mamba engine consists of an axial flow compressor which handles a maximum of 1-3rd ton of air per minute from a forward facing air-intake and supplies it at a pressure of 60lb. per square inch to six combustion chambers, which are radially disposed round the axis of the rear mainshaft.

These combustion chambers are of special interest in that they vaporise the fuel before burning, instead of the more usual system of atomising the fuel in high-pressure spray jets.

The expansion of the hot gases through the turbine produces the power which drives both the propeller and the compressor, the compressor directly and the propeller

through the reduction gear.

Principal dimensions are:

Maximum diameter over circular cowling 29 11-16in., overall length from rear face of propeller fitting cone to rear face of turbine housing 57in., net dry weight 760lb.

The engine, viewed from the side, is made up of a number of components

First, the front cover enclosing the reduction gear and aircraft shaft.

Then, immediately behind the front cover, is the annular air intake, and behind this the compressor casing.

Above the compressor casing are mounted the auxiliaries.

Behind the compressor is the diffuser casing, which leads into the six combustion chambers surrounding the turbine shaft-housing.

The two-stage turbine is located in a housing at the rear of the combustion chambers, and, finally, the exhaust cone and propelling nozzle are fitted in this order at the rear of the engine:

by
Boris Carone

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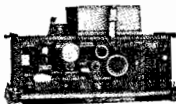
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THE REDUCTION GEAR AND FRONT COVER

The reduction of speed required is from the compressor shaft speed of 15,000 rpm down to a propeller shaft speed of 1450 rpm. The reduction is carried out by means of an epicyclic train.

The helical sun gear is driven from the front of the compressor shaft and drives three helical planet gears.

These three planet gears drive three further planet spur gears on the same axis, and the latter engage with a fixed annular gear.

PLANET GEARS

The planet gears are attached to the propeller shaft by means of a carrier, and, consequently, the propeller revolves with the planet gears inside the stationary gear in an anti-clockwise direction, as seen from the rear (the same direction as the turbine and compressor).

Only the sun and planet gears of the first train are helical.

The stationary annular gear is prevented from rotating by eight links connected to eight pistons, which are automatically balanced in cylinders by oil pressure. They are mounted radially, and form torque-meters.

The pressure of the oil in the cylinders is recorded on a gauge in the pilot's cockpit.

The formula for finding the bhp of the engine at any given moment is as follows:—

BHP equals oil pressure in lb./sq. in. x rpm

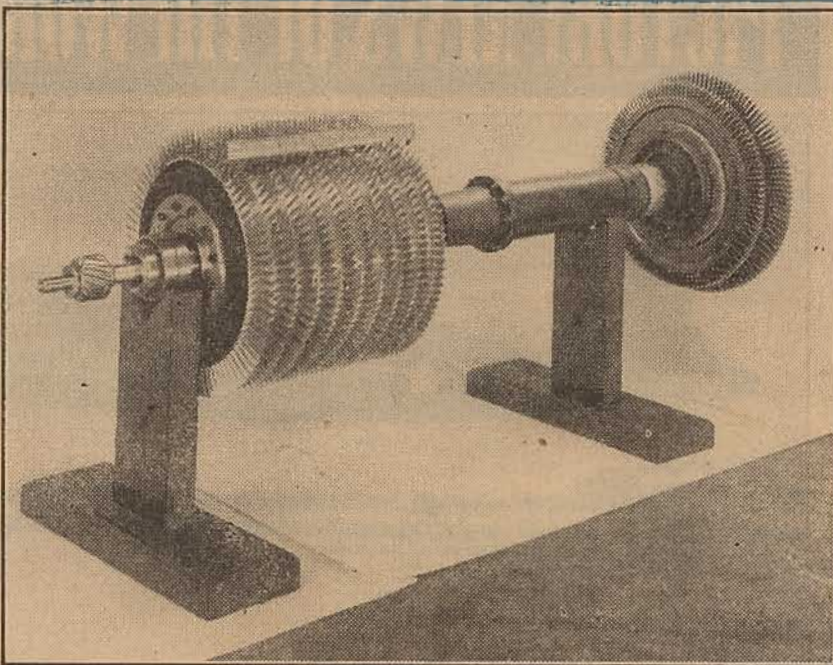
1750

The planet gears are mounted on roller bearings at the front and a ball and roller bearing at the back. The entire thrust from the propeller is taken by a ball-bearing in the front cover. The radial and gyroscopic loads are taken by the same ball-bearing and by a plain bearing at the rear of the propeller shaft.

THE AIR INTAKE

The forward facing annular air intake at the front of the engine,

MAMBA AXIAL-FLOW COMPRESSOR



The Mamba ten-stage axial flow compressor and two-stage turbine assembly. The small size of the compressor is noticeable in comparison with the 12-inch ruler. It handles over 20 tons of air per hour.

to which the front cover is attached, is bolted to the compressor casing and is a magnesium casting.

Provision can be made for anticipating by drawing hot air from a point between the two turbine stages and delivering it to the air intake.

THE COMPRESSOR

The ten-stage axial flow compressor has a compression ratio of 5.1 at maximum sea level static take-off rpm, and uses about one-third of a ton of air per minute, 13½ lb. per second. Consequently, in one minute the Mamba consumes more than its own weight in air.

The compressor consists of a stainless steel drum, to each end of which are attached steel extension shafts.

The front shaft is mounted on a pair of angular contact ball-bearings. The rear shaft is mounted on a roller race. The turbine shaft is connected to the compressor shaft by a coupling, and is supported on a roller bearing. The coupling incorporates a phosphor-bronze spherical bearing to ensure self-alignment between the turbine and compressor assemblies. The ten rows of aerofoil section aluminium blades are attached to ten twin steel discs, which are shrunk on to the steel compressor drum.

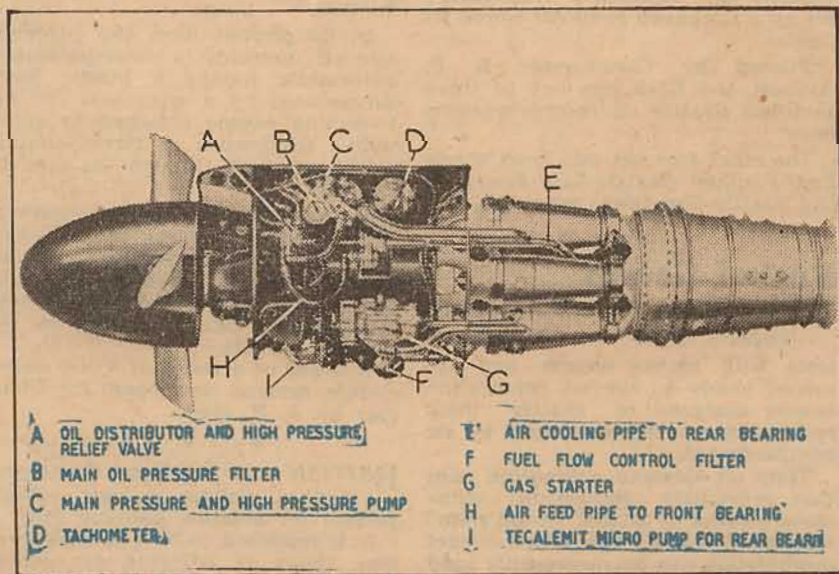
STATOR CASING

The whole assembly is enclosed in a stator casing of forged aluminium. The casing is split on the horizontal line, and contains nine rows of fixed aluminium stator blades. A drive is taken from the compressor front extension shaft to the propeller reduction gear, and, via propeller reduction gear and a bevel drive, to the auxiliary box.

The compressor exerts an axial thrust in a forward direction (opposite to the direction of the air entering the intake), and the turbine exerts a lesser thrust towards the rear of the engine. Consequently, these two opposing forces largely neutralise each other, and any remaining thrust in a forward direction is taken by the front compressor bearing, the compressor shaft being placed under tension by the action of the two opposing forces.

The front main bearing is oil-cooled.

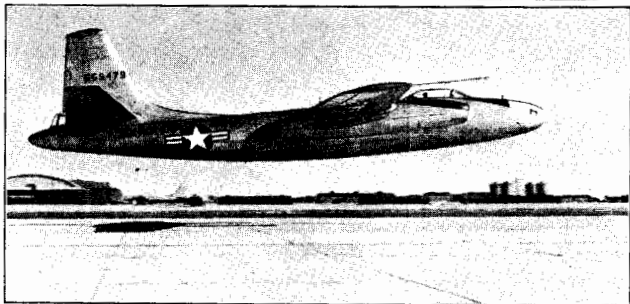
Air enters through an annulus forward-facing air-intake at the front of the engine and passes in a straight flow to the compressor.



The Mamba gas-turbine propeller engine showing the arrangement of the auxiliaries.

(Continued on Page 83)

PICTURE NEWS OF THE WORLD'S SKYWAYS



North America's prototype XB-45, four jet bomber, hurtles down the runway only a few feet off the ground in a spectacular buzz job at better than 500 miles an hour. Purpose of the low level run was speed calibration test at USAAF's Muroc Desert test centre. B-54As are in production at North American Long Beach, California, plant.

Unusual lightweight

A NEW and strikingly unorthodox aeroplane is expected to fly for the first time very shortly.

Named the Satellite, and developed and constructed by the Planet company, it is a four-seat light plane with the engine in the middle of the fuselage driving a propeller situated aft of the tail.

The airframe is made of magnesium alloy and embodies a novel method of construction.

These unusual features result from the determination of the designer, Major Dundas Heenan, to produce a light plane of perfect streamline form and the lightest and simplest structure.

The fuselage is a smooth and beautifully shaped shell with the cabin in the nose, the 250hp Gipsy Queen engine enclosed behind the cabin, and a shaft drive to the pusher propeller at the extreme tail.

The position of the engine and propeller will greatly reduce the noise level in the cabin, as well as ensuring a smooth flow of air over much of the Satellite's surface.

Not content with an unusual layout, the Planet company have also chosen a new constructional material and evolved a new method of airframe construction.

By the use of suitable thickness of magnesium the main stresses are taken by the skin, thus eliminating the necessity for internal strengthening members.

Estimated performance figures indicate a maximum speed of 210 mph, a cruising speed of about 191 mph, and a landing speed of 54 mph.

Ready for record

NORTH AMERICAN FJ-1 Navy jet fighter is being groomed for the west-east speed record attempt.

Warm-up inter-city flights are being continued to measure fuel consumption and develop cruise control data.

Latest performance is a one-hour 58 minutes 7 seconds record-breaking flight from Seattle to Los Angeles at an average speed of about 550 miles an hour.

The flight was officially timed by National Aeronautic Administration officials and replaces a 1946 record set by a Lockheed P-80 Air Force jet fighter.

Piloted by Commander E. P. Aurand, the FJ-1 was one of three that left Seattle on record-breaking hops.

The other two ran into head winds that baulked Seattle-San Francisco and Seattle-San Diego records.

* * *

Rocket Bombs

UNITED STATES Air Force ordnance experts have now completed tests with rocket booster and armored heads on special penetration bombs designed to shatter thick reinforced concrete structures by air bombardment.

Tests on German submarine pens that previously successfully withstood attacks by 22,000 "grand slam" bombs indicated the armor-rocket combination can be successfully used against this kind of target.

Flying car

CONSOLIDATED Vultee's flying auto is undergoing flight tests again following repairs necessitated by the aeroplane's crash landing at San Diego last November.

A 35 minutes' test flight was "highly satisfactory" according to test pilot Bill Masters.

Mr. W. A. Bles, vice-president in charge of sales for Convair, announced that the winged auto will be subjected to further flight tests and study before the company reaches a decision on its ultimate development for commercial production.

In its present form the roadable aircraft presents a four-passenger automobile having a plastic body surmounted by a wing and 190 hp Lycoming engine attached to automobile framework at three holding points, reaching through the roof of the car.

A rear-mounted 26½ horsepower Crosley engine powers the automobile, which features extreme streamlining, hydraulic brakes, fluid drive, pneumatic shock absorbers, and unusually good riding qualities for so small a vehicle.

It is one of a series of flying automobile designs developed for Convair by J. P. Hall.

* * * * *

BRITISH scientists have developed methyl iodide, a new extinguisher for aviation gasoline fires.

It is supposed to be non-toxic and four times as effective as carbon tetrachloride.

Fun and games!

AMERICAN Airlines have faced an embarrassing task explaining why one of their D.C.4's had gone into a violent dive, or a clear, calm day, near El Paso, had flown upside down, and dumped 48 fear-stricken passengers out of their seats.

A Frenchman, doused with the contents of the plane's chemical toilet, afterwards was informed apologetically: "This is not normal operating procedure in American aeroplanes."

The Civil Aeronautics Board has revealed the simple, if startling, truth.

The whole thing had been a witless practical joke.

Its perpetrator was the plane's veteran chief-pilot, Captain Sisto, of Los Angeles.

He was riding as a check-pilot while another pilot, Captain Beck, familiarised himself with the route.

As the plane soared west at 8000 feet, Sisto reached down from a jump-seat behind Beck and fastened the gust-lock—a device used to lock the rudder, elevator and ailerons while the plane is on the ground.

The plane began a steady climb. Puzzled, Pilot Beck adjusted the trim tabs on the plane's control surfaces to bring the nose down.

Then, still undetected, Sisto released the gust-lock.

The plane immediately went into an outside-loop.

Both Sisto and Beck, neither of whom had fastened his safety belt, were thrown from their seats.

Two things saved the plane.

Sisto struck buttons which feathered the propellers of three engines.

Co-Pilot Logan, who was securely belted-in, was able to roll the ship right-side-up, a bare 300 to 400 feet from the ground.

Captain Sisto resigned.

* * *

Height record

GREAT BRITAIN regained the world altitude record for heavier-than-air machines recently when a de Havilland Vampire fighter, fitted with the same company's Ghost jet engine, reached 59,492 feet, beating the previous record by 3400 feet.

The announcement was made after two days official checking of the recording instruments.

Group-Captain John Cunningham, de Havilland's chief test pilot, who flew the Vampire, said: "It was quite a straightforward flight. I just flew the plane to the highest point it would go with that engine and then came down. It took about half an hour to go up and 18 minutes to come down—all without incident."

Taking off from Hatfield Aerodrome, he headed towards the south coast, climbing steadily.

Over Portsmouth at 42,000 feet he turned back towards Hatfield, reaching the record height just north of the aerodrome.

At that height, more than 11 miles above the earth, the sky is black.

Looking down, Cunningham could see almost the whole of the south coast and much of France.

The temperature outside was many degrees below zero; inside, a special heater warmed the cabin to the temperature of a sunny day.

Because of the pressurisation, the cabin air was the same as at 37,000 feet, a condition which nevertheless imposed considerable strain on the pilot.

The last few hundred feet of altitude called for skilled piloting and exceptional effort from the jet engine.

The record holder is basically a standard fighter as at present in service in the Royal Air Force and abroad, but has an increased wing-span and minor changes in equipment to assist climbing to great heights.

* * *

THE Boeing Company is still continuing work on its mammoth B-52 project.

This giant bomber, to be powered by turbo-prop engines still in an experimental stage, will be the largest land plane ever built.

Martin's XB-51 and Convair's XB-53 originally scheduled to be in the same size category as the B-52 have been abandoned.

* * *

New float plane

ESSNA Aircraft Company has received Civil Aeronautic Administration approval for a floatplane version of the all-metal four-to-five place model 190 (and model 195).

Principal alterations, except for the floats, call for additions of two small all-metal fins at the elevation tips, giving the plane a triple tail fin configuration.

Fins were needed for additional directional stability.

Double water rudders on the Edo Model 3930 floats are actuated by cables leading from a horn installed at the location where the tail is placed in the landplane version.

The 195 floatplane, which uses a 300 hp Jacob's engine, is described as the fastest commercial floatplane on the market.

Cruising speed is more than 130 mph at 7000 feet, at 70 per cent. power.

Top speed exceeds 150 mph.

The 240 hp continental-powered 196 has cruising speed greater than 120 mph and top speed above 140 mph.

Take off is described as unusually good due to the Hamilton Standard controllable propeller.

As a cargo plane, the 195 on floats can carry 900lb. cargo with 300-mile range, or 600lb. cargo with 600-mile range.

* * *

Tests on ME262

THE United States Air Force is still pushing its extensive test programme on the German ME262 twin jet fighter that saw combat in the last war.

The Russians are producing large quantities of a much improved version in German factories under Russian control.

Hughes Aircraft Company has finished rebuilding one ME262 under an Air Force contract.

Flight tests, including simulated combat against the P-80, P-84, and P-86, are scheduled to begin at Muroc Field this month.

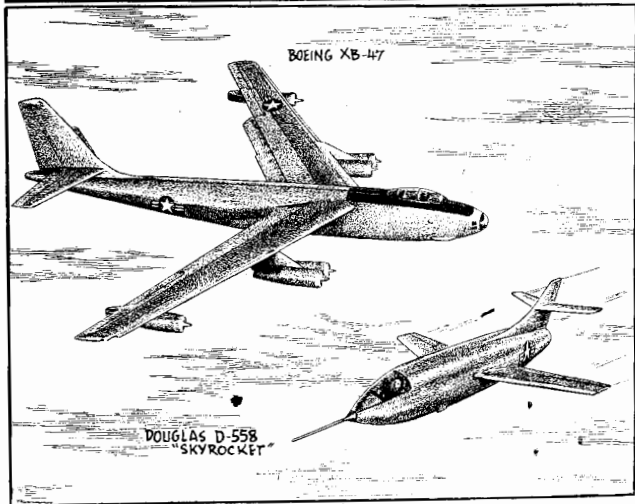
Meanwhile full-scale tests of a re-conditioned German Jumo jet engine, used in the ME262, are getting under way at Moseleys Grand Central Airport, Glendale, California.

BRITISH HELICOPTER BY BRISTOL



The first British commercial helicopter, Type 171, successfully made its first flight in the hands of H. A. Marsh, Bristol chief helicopter designer. The prototype is powered by a Pratt and Whitney Wasp Junior engine giving 450 bhp for take-off. The reason for this choice was that, at the time the 171 was designed, there was no British engine suitable for installation. While the helicopter was being developed the Alvis Leonids made its welcome re-appearance. This engine was immediately recognised as an ideal power plant for the 171 and a special installation was investigated by Alvis. As a result, the production version of the Bristol 171 will be fitted with this new British power unit. Accommodation for four, including the pilot, is provided in the roomy cabin which is soundproofed and well provided with windows to afford the pilot and passengers with a maximum all round view. The 171 has an overall length of 31ft. 6in. and an overall height of 8ft. 11in.

U.S. PLANES USE ROCKETS AND JETS



Slimly tapered fuselage and swept-back wings and tail characterise the design of the two new American aircraft types sketched here—though in other respects they are widely different.

FIRST, the Boeing XB-47 (top left) is the US Army's new experimental bomber. The plane is designed to carry a bomb-load of more than ten tons, with a gross weight of 125,000lb.

Experts have described the Boeing XB-47 as the most challenging of the American designs undergoing tests.

The plane is about the same size as the famous Boeing B-17 Flying Fortress, but is classed as a medium bomber. It is reported to be capable of a speed of "630 miles an hour-plus."

Location of the jet motors on the XB-47 is unconventional. Two power nozzles, each containing two motors mounted side by side, are suspended about one-third of the way out along the wing. A single-jet motor is placed nearer each wing tip.

The fuselage tapers to the tail. The fin sweeps up at a pronounced

rearward angle and the tapering tail planes are also back-swept.

The wings, which are ultra-thin in section, show a 35-deg. sweep-back. An interesting feature is the use of retractable wing slots on the leading edge for efficient control at low speed.

LANDING GEAR

Landing gear is of the unusual bicycle-type, consisting of two groups of double wheels in the base of the fuselage (one pair just forward of the wing's leading edge and the other well back from the trailing edge), and outrigger wheels mounted in the base of the inner turbo-jet unit nacelles. All landing wheels retract in flight and are housed behind snug-fitting doors.

Built by Douglas Aircraft Company for the US Navy, the D-558-2 turbo-jet and rocket-powered Skyrocket combines both rocket and jet power, swept-back wings and tail—

indicating the shape of things to come as the aeronautics industry and research edge closer to the era of rocket flight.

The new Skyrocket is to flight at the zones of speed where the Sky-streak left off—with the world's speed record of over 650 miles an hour.

The plane is the first pilot-carrying aircraft to utilise both jet and rocket propulsion. The project for its development has been carried out by the US Navy, the Douglas Aircraft Company and the US National Advisory Committee on Aeronautics.

The Skyrocket has swept-back wings of conventional subsonic-type section, but with rounded leading edges and contours. In addition to a Westinghouse turbo-jet engine used for take-off, climb and landing, it has a rocket motor for high-speed operation.

(Continued on Page 87)

AN ADJUSTABLE LIGHTING STAND

Every photographer, sooner or later, is tempted to take some pictures by artificial light. Whether he already knows it or finds out from experience, results soon show that controlled lighting is the key to a successful picture, be it a portrait or a still-life study.

It is essential to be able to adjust the lights to produce the desired effect of light and shade before the exposure is made. When taking photographs by ordinary room lighting this can be done to a certain extent by moving the subject, but the range of such movement is generally limited by considerations of background and camera distance.

The obvious alternative is movable lights, and the stand illustrated is sufficiently versatile in its movements to enable it to be used in a great variety of positions, giving complete control of the lighting. The design and construction are both simple and conventional, the actual stand being made of wood with metal for the adjustable clamp and reflector.

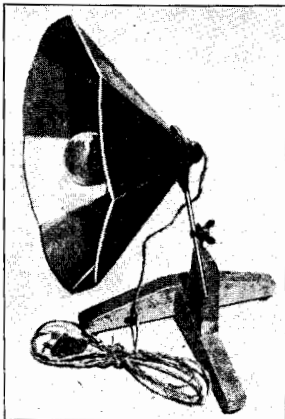
The three pieces forming the stand are cut from a length of 2 in. by 1 in. timber, planed to shape and sandpapered to a smooth finish. Both joins in the base are straightforward mortice joints, the one forming the "T" shaped base being glued. It is worth while taking some pains over the fit of the upright in its slot in the base, as it is very convenient to be able to pull this out to pack the stand flat for storage or transport.

MAKE A TIGHT FIT

It should fit tightly enough to make sure that there is no risk of the lamp falling out in any position. The stem of the "T" forming the base has a 1/16 in. hole drilled at the end for use with a stiff wire hook, by which it can be hung from the picture rail or the top of a door. Less elegant and convenient, but probably as effective would be a loop of string.

Protection to polished table-tops or wall paper is afforded by fitting three small rubber feet to the base. Finish on the woodwork is a matter of taste, but if a surface other than plain wood is required it should be remembered that the finish will have to withstand a fair amount of handling.

The wooden upright carries at its top end a metal strip



The completed lamp and stand.

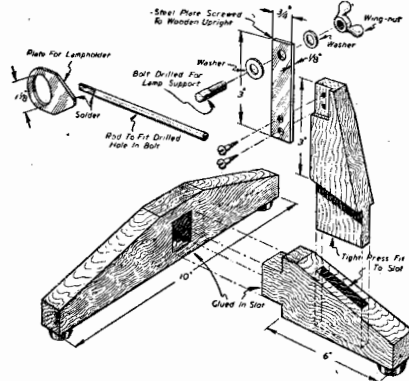


Fig. 1.—Details of the component parts for the adjustable floodlight stand.

through which passes the clamping screw. This screw is a short length cut off a 3-8 in. bolt. Choose a bolt with half an inch or more of plain shank so that one side of the hole through the plain part of the shank so that one side of the hole almost cuts into the start of the thread.

The size of the hole will depend on the rod selected to hold the reflector—about 1/16 in. diameter is suitable. To start the drill on a rounded surface first file a small flat on the shank, then centre-punch the spot where it is desired to start the hole.

DRILLING

"Sight" the drill through the middle of the shank, keeping the hole as square as possible with the bolt. Cut off the bolt head with any unnecessary part of the shank, and also any excess threaded portion. Procure a wing nut and two washers to fit (Fig. 1). The order of assembly is: Pass the rod through the hole in the bolt, slide on a washer from the threaded end, pass the bolt through the hole in the stand upright, fit the second washer and screw on the wing nut. The nut will try to draw the bolt through the hole in the plate, pinching the rod tightly against the washer.

The rod carries the lamp holder on a pear-shaped plate to which it is

BARGAIN RELEASES



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P.M.G. MORSE KEY **10/- ea.**
(Without Headphones).

P.M.G. MORSE KEY. With brand new Stromberg-Carlson headphones **19/6**
Postage 1/6 extra.



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Ex-Air Force. Containing best quality condenser lenses and adjustable reflector. Parts can be used for many purposes. **39/6 ea.**

Postage 2/6 extra.

COMPONENTS INCLUDE THESE VALUABLE LENSES.



No. 1 Diam. 3 5/8 Foc. Len. 10in.
No. 2 Diam. 3 1/2 Hollow Ground. No. 3 Diam. 3 1/2 Foc. Length 4 1/2 in.
No. 4 Diam. 2 3/8 Foc. Length 6 1/2 in.
+ No. 5 Diam. 1 1/8 No. 6 Diam. 1 1/8 Amber Coloured ordinary.



Genuine P.M.G.
Morse Key,
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Complete with Steel Carrying Box, 8 1/2 x 7 1/2 x 7. Worth at least 5/6/10/-.
With Carrying strap.

Our Price . . . 7/6 ea.

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OUR PRICE
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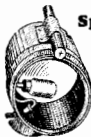
Postage, N.S.W., 1/3; Interstate, 2/-.

GREASE GUN



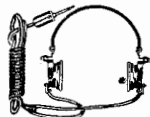
ZERO PUSH-TYPE GREASE GUNS, EX-ARMY.

3oz., slightly used, perfect order, 9/6 each; 5oz., slightly used, perfect order, 12/6 each; 10oz., slightly used, perfect order, 15/- each, Postage 1/6 extra.



Spot Light

Ideal for fishing, hunting, shooting, Brand new. Original cost £2/15/- each. Our Price **17/6** or together with Morse Key, Light and Case, 25/-, Complete with Stand. Freight 3/-.



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PLEASE NOTE: These 'phones are brand new, ex-Army, and not military rejects.

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MAGNETO SPANNERS.

- 1 Magneto, 2BA x 4BA.
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With 1 Pair PLIERS

One 1 1/2-lb. BALL PEIN HAMMER.

One Toolbox, 3 1/2 in. x 7 in. deep x 1 1/2 in. long.

PRICE, with Steel Spanners **£2/2/6**

PRICE, with Van Chrome Spanners **£2/10/-**

Or BOTH LOTS OF SPANNERS in Van Chrome, with Two Magneto Spanners, Pliers and Hammer. THE LOT ONLY

Postage: N.S.W., 5/6; Interstate, 6/6. **£4/5/6**

S.A.E. SIZES VAN CHROME.

- 1 S.A.E. Spanner, 7-16 x 1/2.
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- 1 S.A.E. Spanner, 5-8 x 1/2.
- 1 Spanner, 13-16 x 1.
- 1 S.A.E. Ring Spanner, 13-16 x 7-8.

Complete with

- 1 Pair PLIERS.
- One 1 1/2-lb. BALL PEIN HAMMER.
- One Magneto Spanner, 2BA x 4BA.
- One Magneto Spanner, 6BA x 6BA.

One Metal Toolbox, 3 1/2 in. x 7 in. deep x 1 1/2 in. long.

THE LOT FOR **£2/10/-**

DESIGN FOR METAL REFLECTOR

soldered. Both this plate and the one on which the clamping bolt is mounted can be either of stout sheet brass or steel, a strip 1½ in. wide and about 8 in. long being sufficient to make both parts. A useful source of material for such jobs as this is an old brass name plate. These can occasionally be picked up quite cheaply from junk dealers or sign writers. A generous flat, half an inch long, is filed on the rod where it is to be soldered to the plate to provide a strong joint.

The hole in the plate is a bare 1-8 in. diameter to fit the standard lamp-holder. This plate and the base of the reflector are both clamped under the shade-ring on the lampholder. A thick cardboard washer between the two ensures a snug fit. The base of the reflector, which is held by the lampholder, is merely the bottom of a cocoa tin. This has a spun-over edge, giving it a useful stiffness.

METAL REFLECTOR

The reflector itself is of sheet zinc. Sheet tin could be used, or aluminum—with its advantage of lightness and good surface. However, in this case, tin was not available, so zinc was chosen for ease of soldering. The diagram (Fig. 2) shows the reflector laid out in the flat before bending, the dimensions given being suitable for most purposes. It can be bent to form a plain cone, of course, if that is preferred to a series of flats.

To form the bends cleanly, mark off the lines along which it is to be bent and lay a steel ruler along as if it were intended to score through with a knife. Press the ruler down heavily with one hand while lifting the metal against the edge with a slight pull with the other. Start the bending by dealing with the left hand one first, working from left to right. This ensures having a flat piece to grasp to be bent up each time, which will be found much easier than trying to bend an already shaped area.

The two surfaces at the join—one inside, one outside—are tinned and sweated together. Bend in the bottom tabs, tin their outer surfaces and sweat to the tin base.

REFLECTOR PAINT

A coat of paint inside is desirable to make the most of the light, especially if sheet zinc is used, as this goes very dull after a time, particularly on exposure to the heat of a high-power bulb. Either plain white or aluminum paint is suitable, a matt surface being quite effective. A coat of black enamel outside adds greatly to the appearance, hiding surface marks or irregularities in enamel soldering.

A much lighter type of reflector, though not so durable, can be made from thin, white cardboard, such as Bristol board. The same measurements apply as for the metal one, except that the soldering tabs at the base are omitted. The best way of mounting this reflector is to attach it to a miniature edition in metal, which is held by the lamp-holder in the same way as the all-metal version.

The same diagram of the reflector

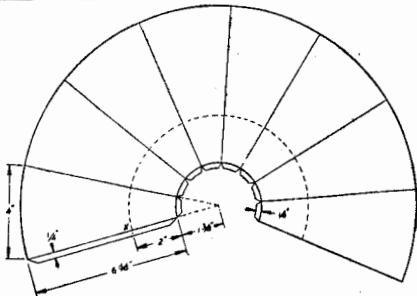


Fig. 2.—The layout of the metal reflector.

in the flat is used, making the length from neck to outer edge 2 in. only, as indicated by the dotted line at "X." This is small and light enough to be cut out of a piece of cocoa tin. Before bending for the flats, punch or drill two small holes in the middle of each flat. These are for attaching the cardboard reflector by means of wire fasteners from magazine bindings. Collect sufficient fasteners before punching the holes, so that they can be used as a guide for the spacing

of the holes. After completing the tin adapter, fit it over the neck of the cardboard reflector, prick through the punched holes in the tin, insert the wire staples and clench over inside.

The only dimension at all fixed is the diameter of the hole in those parts which fit on the lampholder, but as a guide, the lengths of the wooden pieces in the stand illustrated are: Base, 6 in.; base cross-piece, 10 in.; upright, 3 in. above the base.

BUILDING THE TEST MATCH SPECIAL

(Continued from Page 55)

CARD HOLDER

If you want to be really smart, you could make an improved holder by providing side pieces which will slope it forward about 30 degrees, making a more convenient angle for writing. However, you can please yourself about this.

The best headphones to use are the high-impedance type—generally about 2000 ohms per earpiece. However, we have used Disposals types of low impedance and obtained quite good results, although not quite as good as with the better phones.

THE AERIAL

The aerial can often be improvised by clipping the aerial wire to the mattress of the bed, which generally provides enough pick-up. However, a wire round the picture-rail, or an outside aerial, might be even better. As a rule, no earth will be required, as the connection to the mains should suffice. You can, however, experiment with both earth and aerial, as is generally done with these small sets, and use whatever gives you best results. The aerial wire is led

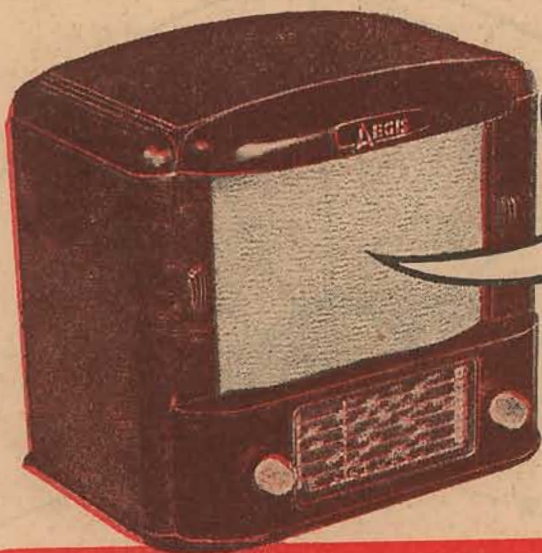
out through the back of the cabinet, as is the power lead.

Take great care to see that the power lead is well installed. As a protection against it pulling out of the set, we ran ours through the chassis in the front left-hand corner, first tying a knot in the cord so that it could not come through the hole. There will be plenty of room at the side of the battery for the power lead to come away under the chassis and through the back of the cabinet.

THE CABINET

The cabinet is really a wooden box 4½ inches deep and having an outside front measurement the same as the front panel. We made ours out of 3-8 inch wood, some glue, and a few brads. If you stain yours to suit your taste, or cover it with leatherette, your little set will look just the thing.

You will find this little set, and the idea behind it, really something. We can only say that our Editor has very snarply appropriated it for his own use, score-cards and all, and is all set for his Test Match listening!



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SHORT WAVE NOTES BY RAY SIMPSON

During the next few months a large number of our readers will be anxious to hear the broadcasts of the forthcoming Test Matches between the M.C.C. and Australia and it would appear that these will be far superior to those given before the war.

SHORT descriptions of play have already been given covering the various county fixtures and these have been tuned in at excellent strength especially on the 13-metre band. Conditions will no doubt change slightly as the season progresses, but these interesting broadcasts will undoubtedly be heard well on one frequency or another.

The well-known voice of Arthur Gilligan will be heard in the test broadcasts and it only requires Vic. Richardson with him to recapture the atmosphere of the last Test series in Australia. These broadcasts will, of course, be relayed over the broadcast band stations, but quite often one can find better listening by tuning them in direct on the short-wave bands.

F.M. RADIO TELEPHONE

An interesting application of the radio telephone took place recently in Botany Bay, NSW, when it was used between a tanker anchored in the bay and the Bitumen Oil Refinery plant near Bunnerong. The equipment consists of a fixed transmitter and a receiver which is located at the refinery, while the balance of the equipment is mobile and installed on the tankers out in the bay.

The whole of this equipment was de-

signed and constructed by one of Sydney's largest radio manufacturers and installed and tested by their own personnel.

This means of communication was the only practicable method of ensuring immediate contact between the ship and the refinery and gives us yet another example of the many commercial uses of the radio telephone. The frequency used by this system is probably well over 100 mc, which makes it very unlikely that conversations will be intercepted by unauthorised listeners.

RADIO AUSTRALIA DX SESSION

The DX session heard from Radio Australia every Sunday has become very popular, not only in this country, but also overseas, as we have had quite a number of letters from listeners who have commented on items they have heard from time to time. As from Sunday, May 9, these DX programmes will be heard at 3.25 pm, and also at 11.27 pm, so if you miss the afternoon broadcast you can wait up on the Sunday night and tune in the repeat broadcast at 11.27 pm.

Graham Hutchins is always very appreciative of any short-wave information which would be suitable for this session and it should be sent to him c/o Radio Australia, Box 780H, GPO, Melbourne.

LISTENING TO AERADIO SIGNALS

MOST listeners have logged some of the many aerodrome and plane transmitters and we are indebted to Mr. W. G. Poole, of North Bexley, NSW, for full details of the Aeradio Communications System at present in operation.

Melbourne, 3160kc. (alternate 6575kc., 325kc.). Mangalore, 325kc. (alternate 3160, 6575kc.).

Holbrook, Wagga, Canberra, 325kc., 3160kc., 6575kc.

Dubbo, Kempsey, Coff's Harbor, 3160kc. night, 6575kc. day.

Brisbane, 325, 3160, 3175, 3298.5, 6557, 6575kc.

Aerodrome Approach Controls transmit on 385kc., Brisbane, 2822kc., Sydney and Melbourne. Receive on 4495kc., Brisbane, and 2834 kc., Sydney and Melbourne.

Planes transmit on 3270, 3260, 3298.5, 6540, 6557, 6527kc.

Aerodrome Tower Control (take off and landing).

Brisbane. Same as approach.
Sydney, 265, 6500kc. and 116.1mc.
Canberra, 4495 kc. and 116.1mc.
Essendon, 305kc. and 116.1mc.

All receive on 4495kc., 116.1mc. and Mascot also receives on 3105kc.

It should be noted that toward the end of April it was intended to change the 116.1mc. channel to 118.1mc. so quite likely this change has already been made but of course every few readers will have receivers capable of tuning to this high frequency.

In connection with all the above frequencies it should be noted that all available channels are not always in simultaneous use.

Thanks to Mr. Poole, listeners should now have a much better idea as to just where they may hear these transmissions as on some occasions they are very interesting especially when an aircraft may be in difficulties or during bad weather.

READERS' VERIFICATIONS

AS verifications have been so scarce during the past month we are listing those that have been received, even though they do not reach our minimum of 12.

Mr. R. Rooke. ZL2-3-4, Dakar, YFA4, TAP6.

Mr. R. Krumbek. Algiers, FZI, HER3, SEAC, Geneva 6.34mc., HLKA, Paris, HCJB 15.11mc., Madrid.

Mr. E. Moore. Munich, KZOK, KZPI, Algiers.

Mr. R. K. Clack. XMPA, EPB, WLKS, CHOL, CHLS, ZL2-3-4, KZPI, Manila, 11.84mc., XGOY.

Mr. J. B. Hargreaves. SEAC, ZL2-3-4, Saigon, KZRH, CHLS, Manila, CHOL, YDC, VUD7-9-10, HER5, XGOA.

Mr. A. Cushman. OTC5, OTC3, HED6, HER7, YV5RY, CBLX, Azores, KZBU (first report from NZ).

Mr. J. Perriit. ZL17, CFRX, CKLX, CKNC, CKCS, CKRA, CHOL, CKLO, Mr. D. Gate. ZAA, Andorra, OTC2, CHOL, CRFX, CKCS, SEAC, CB1180, LRM, Sofia, CBRX, CHLS, YFA4.

Our Own Listening Post, HJAP, ZBW3, Munich. SVM, KZBU, H12T 9.227mc., VEA1, 6.005mc., Singapore. 11.765mc., VJLJ.

SHORT Wave Notes for the July issue are due on June 5. For the August issue they are due on July 12. Please send them direct to Mr. Ray Simpson, 80 Wilga-street, Concord West, N.S.W.

DID YOU KNOW?—That a 100kw transmitter is nearly completed for "Radio Eireann"—OLR3A on 9.55mc., gives news in English at 7.45 am—Guam has been heard in NZ using 18.1mc. around 4 pm—a Jewish transmitter is operating on 13.89 mc., announcing "This is Palestine calling Haganah station"—a Santiago, Chile station on about 15.4mc. has been heard at 9.30 am, call not known—"Radio Munchen," Munich, is now using 6.08mc. in place of AFN, Frankfurt—WGEO has moved from 9.53mc. to 9.525mc. and WRUW from 17.75mc. to 17.755mc.—Forestry station, VL2FA, has been heard on 6.12mc.—"Radio Malaya," also heard on 6.12mc.—KWX on 19.3mc. calling Manila at 4 pm—Rabat in French Morocco is to have a new transmitter operating on many different frequencies.

MORE LATIN AMERICANS

WE did not have sufficient room last month to list the following stations, which are of special interest at the present time as they are being heard so well.

DOMINICAN REPUBLIC.—From this country we hear the most consistent Latin-American station, H12T, "La Vox del Yuna," located on Ciudad, Trujillo, and operating on 9.727mc., which is excellent at night when they open at 10 pm and nearly as good in the mornings. Another Dominican station which has improved of late is H11Z on 6.315mc., now heard opening at 9.15 pm. There is another Dominican station we heard on about 6.035mc., but so far we have been unable to understand the call or slogan when they open at 10 pm.

ECUADOR.—Here we are limited to HCJB, which can be logged on either 5.96mc., 9.958mc., 12.455mc., or 15.115mc., one or the other of which is usually good strength.

GUATEMALA.—Here we have TGWA, heard very nicely on a Sunday afternoon operating on 9.76mc., and then there is their other outlet on 15.17mc., with a good signal around 11.40 pm, not to mention TGWB, sometimes heard on 6.42mc. late at night.

HAITI.—The only station we have heard from this country within the past few weeks is HH3W on 10.135mc. around 10 pm, but as readers will see by the new station list HH2S on 5.948mc. is being logged by Mr. Moore in Brisbane from 9.30 pm. Just as we go to press we also hear it at our location, but so far it is a very weak signal and suffers from severe Morse interference.

MEXICO.—The loudest station from Mexico is always XEWW on 9.5mc., and it can be heard around 11 pm and also in the late afternoon. Another fairly good one is XEQQ on 9.68mc., which is always audible at 11.0 pm and in the afternoons. On some nights it is possible to hear XERQ on 9.61mc. right underneath VLW5, but it is very difficult to copy the programme. Perhaps what might be called a good second to XEWW is XEBT on 9.625mc., as around 4 pm on Sunday they are really good strength.

In the 49metre band we have XEUW on 6.02mc., heard around 10 pm, but noise spoils it at most locations. Last of all we have XEHH on 11.88mc. which on some occasions is really good a midnight.

PANAMA.—HP5K on 6.005mc., located in Colon, has become a regular now and is heard every night from as early as 9 o'clock. They announce quite a number of stations in the chain and give their own slogan as "La Vox de la Victor." Another fairly good one is HP5J on 9.605 mc., but it is rather difficult of late to separate it from VLW5. The only other Panama station we have heard lately is HP5A on 11.695 mc. when it opens around 10 pm. It is strange that we have had no reports of HOXA or HOXB which were heard last year at good strength.

PERU.—The only entry from this country is OAX4J on 9.34mc. It is not consistent, but can sometimes be heard around 4 pm on Sundays. In New Zealand, however, we have a report from Art Cushen that he is hearing OAX1A, "Radio Declar," 6.71mc. until 2.30 pm, when they sign with "Good Night" melody, and also OAX4M on 6.31mc. and OAX6E on 6.33mc. till closing time of 3 pm. Perhaps a little later in the season we also may hear these stations.

VENEZUELA.—Two stations only from this country. YV5RY on 4.275mc. and YV5RM on 4.97mc. both located in Caracas. Listen for these around 9 pm when they are quite good except for rather high noise level which is typical of this band.

FLASHES FROM EVERYWHERE

BRAZIL.—For some weeks now the Brazilian station PRL3 on 11.72mc. has been coming on the air at 6 o'clock nightly, and by 7 pm strength is quite good. Another station in this country, ZYB7 on 6.095mc. has occasionally been heard around 7 am, though a little difficult to separate from Luxembourg. From overseas publications we learn that PPQ on 11.67mc. is frequently heard in the forenoon calling Buenos Aires, while PST2 on 7.41mc. comes on the air at 9 am, announcing as "Radio Anchieta," or "A Emissora do Planalto." Has any reader ever heard a station on 11.99mc., which Art Cushen hears opening at 8.30 pm. and which he thinks may be PRA2?

FINLAND.—We are indebted to Universalite for information regarding the English sessions from the Finnish stations which are as follows:—OIX2, 9.5mc., 1.25 am to 10.35 am, and 10.15 pm to 10.25 pm; OIX4, 15.19mc. News at 10.15 pm; OIX5, 17.8mc., 10.25 am to 10.35 am, and 10.15 pm to 10.25 pm. OIX7, 6.12mc., 10.25 am to 10.35 am and 10.15 pm to 10.25 pm. Other programmes from these stations are conducted in Finnish or French. It will be noticed that the call letters of some of these stations have been changed from what has been the generally accepted ones and no mention is made of OIX3 or OIX6. The only one of the above stations audible at our location is OIX2.

GREENLAND.—This is indeed an unusual country as far as short-wave listeners are concerned, as we doubt if anyone in this country has heard any stations from that quarter. According to advice from overseas, however, there is now at least one transmitter operating under the call of OXI on a frequency of 5.942mc., with a power of 1kw. The schedule is reported to be from 7.45 am to 8.45 am, with weather report in Danish at 7.45 am, and news in Eskimo at 8.30 am. Their identification announcement is "God Aften. Her Gronlands Radio." Their interval signal consists of chimes and six bars of the Funeral March by Norman Anderson. Our thanks are once again due to the Universalite for this information.

SURINAME.—Some time before the war station PZX5, operating on 15.402mc., was heard at many locations between 9 pm and 9.30 pm. This station is again reported to be on the air, but this time from 9.30 am to 9.45 am, when they relay the news in Dutch from the Hilversum stations PCJ. Another of their stations on a nearby frequency is PZC, 15.405mc., which is heard overseas in telephone contact with WKF at 1.15 am. Both these stations are located in Paramaribo, and are known to verify, so if you are lucky enough to hear them, send your report to Radio Omroep Suriname, Algemeene Vereeniging, Paramaribo, Suriname, South America. Personally, we have never heard either of these stations, but as we said before, they have been logged in this country.

NORWAY.—In the latest DX Bulletin received from the Swedish Broadcasting Service, they give the following news regarding the Norwegian Broadcasting Organisation. "The Norsk Rikskringkasting," in Oslo said in a recent letter published by Radio News that they were short of electricity due to the last summer's drought, and that they would have no possibility of expanding their broadcasting times—as was originally scheduled. They say their transmitter is located in Southern Norway at Fredriksstad at the east end of the Oslo Ford and the antennas are directed east-west from that city. This particular shortwave broadcast for Norwegians abroad takes place from 11 am to noon."

NICARAGUA.—For two or three months now we have been hearing a Latin American station opening nightly on 6.38 mc. at 10 pm, but although the music has reached quite good level the quality of speech has been very poor and identification impossible. This station has also been logged by Art Cushen and Ern Moore, but they, too, could not identify it. At last writing, Art Cushen gave it as OAX4 in Peru, but on recent nights we are now practically certain it is located in Managua, Nicaragua (They should use the record of that name to clinch the matter). All we can make of this station so far is that it is in Managua and that

NEW STATION LOGGINGS

Call	KC	Metres	Location	Time Heard.
Noumea	6000	50.00	Noumea, New Caledonia	8.00 pm
WRUX	9530	31.48	Boston, Mass., U.S.A.	8.30 am
Algiers	9570	31.35	Algiers, Algeria	6.00 am
WRUA	15290	19.62	Boston, Mass., U.S.A.	11.00 am
WRUX	21460	13.98	Boston, Mass., U.S.A.	7.00 am
PHI	21480	13.97	Hilversum, Holland	8.30 pm

it is in the "international band." Who can give further details of this difficult Spanish speaking station which is about the most difficult we have ever tried to identify?

MALAYA.—From the DX session of Radio Australia we learn of the latest schedule of Radio Malaya which was sent to them direct from a listener in that country. Singapore is operating on 7.2 mc. from 2.30 pm to 4.30 pm and 8.30 pm to 2 am on weekdays and from 2.30 pm to 2 am on Saturdays and Sundays. Their other frequency of 4.825mc., is on the air from 8.30 pm to midnight and midnight to 1.30 am. Kuala Lumpur on 6.025mc. is in relay with the 7.2mc. outlet at the same times. During the past week or so there has been another outlet operating on 6.12mc., which would be the Singapore station we verified some months ago when they were testing.

BELGIAN CONGO.—In a recent verification received by Miss Dorothy Sanderson from Radio Congo Belge, they stated that their transmitter on 9.38mc. was only intended to provide reception in the Belgian Congo and was not an International outlet. Despite this, however, many listeners in Australia are hearing

this station. In addition to the above frequency, they state that they are also on 11.72mc. from 8.30 pm to 11 pm, and that another transmitter on 6.282mc. relays both the above stations during all their programmes. This country is one of the hardest to pin down to any definite frequency and call letters, as they quite often turn up on unassigned channels.

CHINA.—In a recent Air Letter from Paul Dilg, of California, he tells us of some new Chinese stations he has been hearing over there. The first of these is XHSR on 5.87mc., heard at night and another one is logged on 6.58mc., which closed down at 11 pm. Three other unidentified stations from this country are on 7.09mc., 9.457kc., and 10.07mc. The first is heard best around 11.30 pm and signs off at 1 am. The second leaves the air around 12.30 am, and Paul thinks it may be XPPA, while the third one seems to take its programme from XGOA and finally signs off at 1 am. This listener has also been hearing XGAS with English lessons at 10 pm, using a frequency of 7.1mc. These Oriental stations appear to be heard better in the USA than they are here.

VERIFICATIONS OF THE MONTH

VJLJ, "Kurrewa."—After having given up hope of receiving it, we were very pleased to receive a card confirming our reception of VJLJ the transmitter aboard the yacht "Kurrewa III," which was heard on 6.28mc. when the yacht was about 200 miles from Sydney during the Tasman race. We have also received a very interesting letter from Mr. Terry Hammond, who was radio operator on the "Drifter" and also navigator. Their call was ZMTT and operated on 500kc. and 8.296mc. and contact was maintained day and night with VIS, ZLB, ZLD and amateur stations except during the cyclone. Mr. Howard says he will verify any reports on ZMTT or his amateur call ZLI0E which coincide with the log. Address, 11 Scheriff-road, Ramuera, SE2, Auckland.

SVM, GREECE.—One of the most elusive verifications we have ever sought is that for SVM, Athens, on 9.935mc., as despite three letters enclosing reply coupons and sent by registered post, no reply could be obtained. However, at long last we have received a very nice letter from the manager of Cable and

Wireless, who operate the station, verifying our report. He stated that owing to the large number of letters received it was impossible to verify, but they had made an exception in our case, as it was the only European country not yet verified. This brings our total of countries verified up to 133. New address for this station is Cable and Wireless Ltd., Franklin Roosevelt-avenue, No. 6, Athens.

H12T Dominican Republic.—We imagine quite a number of our readers have received their verifications from H12T on one or more of their recent frequencies and a point of interest we noticed in the last one we received for 9.727mc. was that they are now also operating another short-wave outlet on 5.97 mc., using the call H14T. This latter station only uses 500 watts as compared with the 7500 watts of H12T. At time of writing we have not heard H14T, but H12T is still coming in very well from 10pm and can also be logged around breakfast time. With their frequent announcement of "La Vox del Yuna," this Latin American is one of the easiest logged of any Spanish speaking station.

New Station Call Signs Logged

HOLLAND.—All readers have heard the Hilversum station on one or more of its many frequencies operating under the call letters PCJ or PHI, depending on the channel in use. One of the best of these is PCJ on 9.59mc., which comes in very well in the early morning.

"Radio Nederland" has recently taken into use a new frequency, 21.48mc, using the call PHI and can be heard opening at 8.30 pm from which time they transmit in English until around 9.15 pm, when they go over to Dutch. At this time they announce as also being on 6.025, 9.59, 11.73, and 15.22mc., and experimentally on 21.48mc., which incidentally is the best of the stations at our location.

NEW CALEDONIA.—For some time now we have been used to hearing Noumea transmitting on 6.208mc., which frequency they returned to after having used 6.16 mc. for a time. They have now made another change and are now on 6.0mc., where they come in at very good level. A point regarding this station which still seems to be not appreciated, is that it is not FK8AA. Many listeners and also radio magazines refer to it as such, but

this is not correct. FK8AA was the call of a Noumea station which used to operate on 6.135mc. and was owned by a photographer by the name of Charles Gauveau. Actually we think this was his amateur call, although he was apparently allowed to operate a commercial service. The present station is "The Voice of France in the Pacific."

ALGERIA.—Our thanks are due to Art Cushen for identifying a station which we had been hearing for some time on 9.57mc. from as early as 5.30 am. This one turns out to be Radio Algerie which has moved from 11.835 to 9.57mc. The programme is in Arabic until 6 am, when sometimes a news service is given and at other times it consists of musical numbers. This programme is entirely in French and there does not seem to be any announcement in English. Both lady and gent announcers are heard and they also use some form of chimes so it can easily be found just slightly lower than GSC. Strength is not particularly good, but sufficient can be obtained to make up a report and what is more, this station is known to verify.

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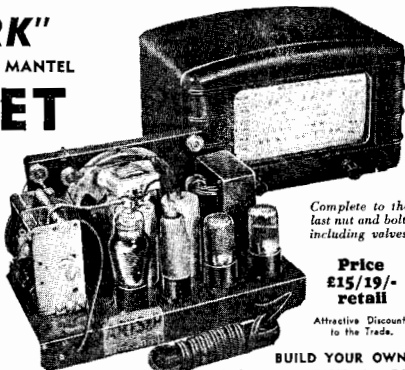
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(Continued from Page 47)

citance and is mechanically good, it will be satisfactory, irrespective of its age. But, if irreparably sloppy or rough in its action, it is better discarded or relegated to a crystal set, where the requirements are not so exacting.

Just a couple of other small points by way of conclusion. Designers have varied the shape of condenser plates a great deal to spread stations evenly over the band. The oldest condensers simply had half-round plates, but newer ones have plates intended to give a linear relationship between rotation and frequency. Hence the initials "SLF," meaning straight-line frequency.

These variations do not affect the ability of the receiver to receive or to separate stations, but only the distribution of the stations along the dial scale. It is therefore wise to use a purely numerical dial scale with condensers of unknown vintage. There is little hope of any old condenser tracking with the dial calibrations set out for, say, a modern "H" type.

CAPACITANCE UNITS

Lastly, the matter of capacitance units. All through the article we have mentioned only microfarads, suggesting values of .0004 and .0001 mfd. respectively for tuning and reaction condensers.

With figures like the above, there is the obvious possibility of error in the number of ciphers and the modern trend is to express values below .001 mfd. in terms of micromicrofarads, abbreviated to mmfd. Simply multiply the figure in mfd. by 1,000,000 and you have the value in mmfd. Thus, .0005 mfd. becomes 500 mmfd., and so on.

The simplification can be carried one step further by replacing the term micromicrofarad by picofarad, and the abbreviation mmfd. to pf., as was done in many wartime service manuals. It is much easier to say and write 100 pf. than .0001 mfd., or even 100 mmfd.

But we guess that is enough for one article!

SIMPLE RAM JET

(Continued from Page 19)

A type of experimental athodyd-powered aircraft design is shown. It will be seen that the pilot, in prone position, is located in the most forward section of the diffuser, which also contains fuel tanks and auxiliary items, such as oxygen, radio and air bottles.

It should be emphasized that such a design would also require provision to be made for auxiliary low-speed power units. At rest, the athodyd develops no thrust, so that to launch it and give it initial speed rockets that can be jettisoned would most probably be used. These could be mounted conveniently along the fuselage close to the wing roots.

(Continued from Page 61).

the meter will still read between 2 and 3 mA, being unaffected by the connection of the test condenser. The "open circuit" test, of course, does not apply to low value paper or mica condensers.

Position 3 of the switch places the normal filter back into circuit, earths the bottom end of the bleed direct, and places the meter in series with Cx. The value of the

16 mfd. 525 peak volts	2.0 leakage mA.
8 mfd. 525 peak volts	1.0 leakage mA.
4 mfd. 525 peak volts	0.5 leakage mA.
25 mfd. 40 peak volts	0.9 leakage mA.
10 mfd. 40 peak volts	0.4 leakage mA.

This chart shows the average of the permissible limits of leakage current as set down by local and overseas manufacturers for electrolytic capacitors.

limiting resistor now connected across the meter is so large comparatively that the meter reading is unaffected by its presence.

SWITCH POSITION

This position of the switch is really the most important as, from the meter readings obtained, the serviceability of Cx is determined.

In the case of electrolytics, the previously mentioned chart applies here. With paper and mica capacitors, the meter should not show a reading after the initial charging burst has subsided. If even a barely perceptible standing reading is evident, the capacitor should be treated with suspicion.

So much then for the action of the selector switch.

A point of interest arises when testing the high capacity electrolytics such as the 100 and 500 mfd. 12 PV type. The short-circuit current of the 12 volt test point is only 4 mA. This is below the permis-

sible leakage current for this type. However, an approximation of the condition may be made by observing the amount by which the meter reading drops when in the "Check" position of the switch. A short-circuited capacitor would reduce the meter reading to zero.

It takes a very short time for the user of the instrument to become conversant with the indications, and the average radio serviceman would soon be able to tell at a glance the general condition of a capacitor of this type under test.

The actual construction of this instrument can best be left to the personal ideas of the individual, who might like to put into use a suitable box which may be on hand.

CONSTRUCTION

The construction of the instrument shown in the photographs was purely along those lines. The case was on hand, the transformer, the switch, and the incidental parts all fitted into the case, leaving the cutting and fitting of a front panel as the only necessary item to complete the issue. Had we recessed the front panel, we could have left the hinged cover on the case for protection of the meter.

With regard to points of interest in the construction, you will note that the voltage test points are recessed sufficiently to reduce the possibility of inadvertent contact. Further, from the viewpoint of safety, the external clips are of the almost totally-enclosed type. The "hot" lead, with its wander plug, is colored red.

Where HT and a meter is involved in a switching network, it pays dividends to recheck the wiring after completion. Furthermore, in any instrument it is always advisable to label connections, switches and switch positions as shown.

U.S. PLANES USE ROCKETS AND JETS

(Continued from Page 78)

The landing gear is housed in the fuselage. Fuel and propellants are also located in the fuselage, together with the turbo-jet and rocket motor.

Wing and tail surfaces are of rib and stringer construction, using high-strength aluminium alloy. The fuselage consists of a semi-mono-coque structure, using aluminium alloy frames and heavy, unstiffened magnesium alloy skin.

Cockpit heating and refrigeration are provided. While having no military armament, the Skyrocket carries a big battery of recording instruments. Air pressures are measured at 400 points on wing and tail surfaces. Control forces and stresses in the structures are measured by 904 electric strain gauges. The de-

tails recorded by the flight instruments are automatically photographed on motion picture films.

All flight controls are manually operated without benefit of aerodynamic balance, power boost or tabs.

The aircraft bears a close resemblance to a winged V-2, with a long, cigar-shaped fuselage tapering to a pointed nose, narrow-span wings of extremely small area, and swept-back tail fin and tail planes. There is no "bubble" to break the smooth surface of the aircraft's clean aerodynamic shape.

Total length is 45ft. 3in. and span 25ft. When the aircraft is on the ground, height to top of tail fin is 11ft. 6in.

THE BANDS WITH BU MOORE

The International Amateur Radio Union, world wide ham organisation, is the union of some 35 national societies. Formed in Paris in April, 1925, by a conference of amateurs from 23 nations, the Headquarters society from the inauguration has been the American Radio Relay League.

UNDER the constitution it is possible for any national society to become the HQ of the union, such as the NZRI in New Zealand and the WIA here in Australia. Business is conducted by the forwarding of calendars to national societies at regular intervals. The societies are required to vote on any Items requested and the Federal executive of WIA looks after Australian interests.

Since the war quite a number of the Axis nations have reorganised their amateur societies and have applied for membership to the union.

The union through its member societies covers 100,000 amateurs of the world, and the organisation provides a method of gauging world-wide amateur opinion.

U.K NEWS

THE British National Society's main problem is still one of obtaining enough paper to print their RSGB Bulletin. The prospects are not very bright,

and, with another cut threatened, it will be practically impossible to cover their increasing activity.

Applicants for an amateur ticket in UK have had a rather lean time of it recently. In one examination 226 sat, 150 passed—63 per cent. failing. Eight questions were asked, covering the following: 1. Calculation; 2. Selectivity; 3. CW; 4. Modulation; 5. Master Oscillators; 6. Transmitter; 7. Aerials; 8. Frequency Meter. The standard of questions on the main were slightly easier than here in Australia.

TVI—television interference from amateur stations is rapidly becoming a problem, and the RSGB has appointed a special investigating committee. When secretary G.C.L. was in USA he arranged for a close liaison with the ARRL on TVI problems. The RSGB recently announced that the Empire DX certificate would be awarded to members only, not to all applicants as previously stated.

CBRS is the call-sign of the official RSGB station engaged mainly at the moment on market station duties. Transmission will be extended to cover other activities when more space is available.

English amateurs have increased their numbers by 1700 during the past year.

The majority of this increase is due to the fact that the GPO granted exemptions from the examination to applicants who served in certain branches of the Services.

THE RUSSIAN PREFIXES

IT is still some job to sort out the various countries (DX count) that comprise the USSR. The latter consists of 16 Republics, but because the RSFSR (the central federation of autonomous republics and provinces) lies partly in Europe and partly in Asia, the maximum possible DXCC score is 11.

The following list should help a little. It shows Continent, Republic, capital and prefix. In Europe—RSFSR, Moscow, UA 1-4-6. Belorussia, White Russia, Minsk, UC2. Ukraine, Kiev, UB5. Armenia (Yvayston), Yrivan, UG6. Azerbaijan, Baku, UG6. Georgia, Sakartvelo, Tbilisi, UFS. Karlo-Finnish SSR, Petrozavodsk, UNI.

Moldavia, Kishinev, UO5. Lithuania, Vilnius, UP2. Latvia, Riga, UQ2. Estonia, Tallinn, UR2. IN ASIA. RSFSR (Yarutsk, Buriatmangel, Siberia, etc.), UA9-0. Kazakhstan, Alma Ata, UL7. Turkmenistan, Ashkhabad, UHQ. Uzbekistan, Tasikent, UIB. Kirgizistan, Frunze, UMS. Tajikistan, Stalinabad, UJ8. The above list shows Republic, capital and prefix in that order.

U.H.F.'s

WITH winter approaching, 6MX has been very quiet, although it did open up on April 17 from 2130 to 2200 HRS to Victoria. 2RU, 2OC, 2ADT, and 2BZ working 2UL and 2GM. No Sydney stations worked VKJ's possibly as it was Saturday night. They were entertaining the NYL.

The first distant contact on 144 was recorded on May 8, when 2BZ in Newcastle contacted 2OC in Wyong. Previously 2OC had been heard by 2ADT in Cessnock, 2UL and 2GM. No Sydney stations worked VKJ's possibly as it was Saturday night. They were entertaining the NYL.

ARRL official BC over WIAW on May 1 announced that the FCC intimated the immediate opening of the 220-225 MC band to US amateurs. General policy among nations seems to be to release UHF Atlantic City bands above 50 MC; hence the release of 144/148 MC here. May meeting of the NSW Division's UHF section will see the end of a very successful year. Under the guidance of chairman Chas. Fryar VK2NP and secretary Maurice Findlay, VK2PW, the section progressed and many educational and interesting lectures were presented. The interests of the UHF enthusiasts were well catered for, as demonstrated by the fact that visitors from the Newcastle district came down on a number of occasions. May meeting will see the election of office-bearers for 1948-49.

With 2PI on 144 from the mountains and 2ADT on 30 at Cessnock, cross-band contacts have been made.

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on Sims. Three hands are in front, W6UXN, W4DQJ, and W3DZL, all with 46 Sixes. The latter has been placed with 46 for over six months.

W.I.A. NEWS

N.S.W. Federal councillor John Mayle, VK2JH reported in the April meeting of the NSW division on the proceedings at the Federal convention. He prefaced his remarks with an appreciation of the work done during the past year by the Federal executive. Little is heard of the work of the FE, as so much of it is in the international sphere. A lot of the subject matter of the report dealt with radio education, and an outline of some of the items can be given.

Considerable discussion was centred around the new Federal constitution, and a new section is to be prepared to cover all State divisions.

The terms under which radio clubs become member clubs of the institute as set out by NSW, were accepted.

A report was presented on the proposed reformation of the RAAF Wireless Reserve.

It was decided to investigate the possibilities of organising an AOCF correspondence course throughout Australia. Power lines and commercial interference were discussed at length and the FE with State co-operation will endeavor to place complaints before the authorities.

A recommendation was made to all divisions on the subject of arranging by agreement, (that is portions of the low frequency section of the 15, 14 and 28 MC bands be set aside for exclusive CW use.

That a standard phonetic alphabet be adopted for Australian use.

It was announced that negotiations were under way for special isotopic procedures for amateurs to be made available.

DX contests were debated at length, and it was agreed that consideration be given to restricting contests to 24 hours operating out of the normal 24-hour period.

The above points are only a few of the matters discussed, and as the year progresses more information will become available.

In keeping with other divisional activities, the NSW Division has appointed 24 Wal Ryan, VK2ZL, as "Food for Britain" officer—he will co-ordinate NSW efforts. NSW efforts in the past have been rather sporadic. VK2ZL has done some very fine work in the last two years. Arrangements are made for the RSGB to be responsible for the distribution of the parcels in the UK. Allocation is arranged by ballot and let us hope with a little more effort next year all our G. friends will receive a parcel from a VK ham.

Any of the F. For B. officers of the W.I.A. divisions would be pleased to receive your donations. Send them along to the W.I.A. box number.

W.W.V. SCHEDULES

FOR those interested in checking frequencies the following are the amended schedules for WWV transmissions.

Transmissions are made on 2.5, 5.0, 10.0, 15.0, 20.0, 25.0, 30.0, and 35.0 megacycles, with varying inputs from 100 watts to nine kilowatts. All the above transmitters operate continuously day and night. The 15.0 MC transmission is being heard here practically right round the clock. A 2.005 second pulse may be heard on a faint tick every second and can be used for accurate timing.

The announcement of the station's services and station call is given by voice on the hour and half-hour.

The accuracy of the transmission is to within one part in 50 million, and that also applies to the time heard on the carrier, which is generally at 440 and 4000 cycles.

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BERU CEST

JUDGING from the lack of general interest in the Beru, it appears as if most of the gang will not compete with increasing QRN on the HF bands. The elusive ZD's and VP's didn't compete and only a VP8 and VP9 incited any interest.

Here in NSW ZED looks like a winner, but ZED and ZDG should be close up.

VQZAT reports that ZSSA may be an outright winner. He also stated that general interest seemed on the wane. Unless the 21MC band relieves the QRN problem, the future of DX contests seems to be uncertain. Maybe someone will get a bright idea for future tests.

W.A.C. ENDORSEMENT

THE issuance of 10MX endorsement stickers for WAC certificates will be discontinued as from June 30, 1948.

These stickers were first introduced some 12 years ago when the DX potentialities of the band were not fully realised. It was an award for the special efforts of the 28 MC pioneers. IARU headquarters will in the future issue stickers for a 50 MC WAC. Although a 50 MC WAC is not to hand yet, some North American amateurs have three continents up and hope for the remaining three to come through.



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THE RECORDS NEWS & REVIEWS

All the highlights of the current releases reviewed this month have been of high quality. They are also well chosen and varied. A record library these days is more than a collection for the enthusiast. It is a necessity for any musician or student of music.

By JOHN MOYLE

CONCERTO FOR PIANOFORE AND ORCHESTRA (DeLius) played by Benno Moiseiwitsch with Philharmonic Orchestra conducted by Constant Lambert, HMV ED 467

There are, and always will be, but two opinions about DeLius. You either understand him or you don't. I am afraid I am one with Neville Cardus, whose essay on DeLius in "Ten Composers" comes as near as may be to explaining him in so many words. Cardus says: "DeLius is not one of the common commodities in the busy market-place of music."

So many consider his work as thin, shadowy, effete. This concerto will, I think, do much to disprove that idea, which is understandable enough if one has heard only the more often performed varieties of what is really a musical lifetime.

This concerto is written by a man who concentrates music as a language to be used just as surely and intelligibly as any other form of human expression. We should not be too hasty with our opinions therefore, if in our pre-occupation with the notes themselves we have not learned to understand this language.

The sensitivity of DeLius as a composer, the strength and depth of his feeling, are at once the key to his genius and his weakness.

In this concerto we can see all these things with startling clarity. In fact I do not think that in all his music one

will find passages written with such force and abandon as here.

There are no movements as generally accepted, nor are they defined by breaks in continuity. There could not be, for the music contains a progressive expression of mood and thought more eloquent than formal.

Within this compass the musical material, which is limited in quantity, is taken through periods of beauty, reflection, reminiscence and sorrow to others of extreme agitation, power and violence.

It is in such a manner that one must approach this concerto, forgetting completely that there are such things as waltzes, foxtrots and kept company in the parlors for so many years. It has not been played enough in this country for a deep assessment of the performance, but all these things are there on the records, and I would say it was a fine one.

The heavier passages tax the surface rather severely at times, but otherwise there is much fine recording. It may not be the best thing DeLius wrote, but it is a fine and important concerto which I for one receive with great pleasure.

RAVEL AT HIS BEST

INTRODUCTION AND ALLEGRO FOR HARP (Ravel) with John Cockerill (harp), Jean Pouget (violin), David Martin (violin), Frederick Riddle (viola), James Whitehead (cello), Arthur Cleggorn (bass), Reginald Kell (clarinet). Last side **PREMIERE ARABESQUE** (Debussy), John Cockerill (harp), Columbia DOX 533-4

Such an array of famous names would make any record lover sit up and take notice. First I would say that the instrumental balance does not suffer from the omittance of so many acknowledged soloists, although the clearly defined recording does tend to break away from the mystic curtain that often lies over such works as older recordings because of their, shall I say, microphone remoteness.

Here the instruments are much closer—closer even than in actual performance, and as a result, they are outlined with almost deadly clarity. I should say this is one of the most difficult of works to record. You should remember all these things when playing it.

The recording, particularly of the harp, is amazingly good. One can actually appreciate the technique of the harpist as he plays the waltzes and the dances. I think to say of a harp record, with which recording engineers are prone to take few risks in this regard, I commend the third and last side in which the harp plays its cadenza.

Personally, I shall place these records in my special pile for further appreciation and study the many fine and delicate blended moments in which they all share. If you have a good machine, you are due for some delightful moments with these records.

Cockerill, of course, has the major part, but it would be futile to attempt an outline of the many fine and delicate blended moments in which they all share.

If you have a good machine, you are due for some delightful moments with these records.

The extra side is one of Debussy's harp classics, and is played by every harpist. But not, I fear, as Cockerill plays it. Do not present it as a visiting card anywhere.

As for recording, it is probably the best I have ever heard of the harp.

BRANDENBURG CONCERTO No. 4 in G major for two violins, two violas and strings with the Boston Symphony

Orchestra, HMV ED 646-7.

Bach's Brandenburg Concertos demonstrate as well as any of his music his amazing capacity and mastery over musical forms and instrumentation as it was made possible in his day. This particular example—a striking comparison with Ravel by the way—displays his mastery of contrapuntal texture which can only be a constant delight.

The recording sounds strangely light at the start until one realizes how successful it is in avoiding swamping of the soloists by a too heavy orchestra. One is able therefore to appreciate their work as such, and not to lose it in the weight of the music as a whole.

At the same time there is no chamber-music effect—it is a concerto as such, I particularly appreciated, for instance, some deft fingering by violins on the first side, which stood out with fine balance. Again in the last movement, the same clear delineation of instruments will be heard.

There is some really fine music on these discs and you will do well to hear them.

A FINE SOPRANO

BRANGES WARNING (Tristan und Isolde) and **Herzeleid** (Parsifal), sung by Kirsten Thorborg with the Victor Symphony Orchestra HMV ED 648.

For a moment I was deceived into imagining that I had mixed a record of floundered with this one. It is quite good enough—in fact I thought "Branges Warning" an almost perfect disc of its type. It is fine, dignified, authoritative singing by one of the finest dramatic sopranos recording today.

Her voice has a vibrant warmth, dignity and authority which stands it in any company. These are things which are demanded of such music. One of our readers have remarked on my lack of enthusiasm for Joan Hammond. Well, it's purely a personal matter, but I can only refer them to a record such as this one, and ask if they can appreciate the difference. At least I have done Joan the compliment of the comparison.

I was immensely impressed by this singing. It is quite the best Thorborg record I have heard so far.

The orchestral accompaniment is excellent.

NERDI WELL SUNG

"CORTIGIANA, VIL RAZZA DANATA" (Rigoletto) and **"DI PROVENZA IL MAR"** (Traviata) sung by Carlo Tagliabue with the Royal Opera House Orchestra.

A remarkably fine dramatic sense is displayed by this fine singer who makes the most of material calculated to test the resources of any voice. He has outlined the pathos, despair, and fury of the baffled Rigoletto with a mastery. Caught in a web of his own weaving, one feels rather relieved not to be among the courtiers he lashes so violently. The Traviata aria is in greatly different mood, as Germont tries to comfort his unhappy son Alfredo.

The only criticism one feels inclined to offer is his somewhat excessive vibrato, which becomes evident particularly at the end of the Rigoletto disc. Too much vibrato is rather badly defined in recordings. The orchestra support is good and the recording likewise.

ELIZABETH'S GREETING, Act Two (Tannhauser) and **ELSA'S DREAM** (Lohengrin), sung by Joan Hammond with the Philharmonic Orchestra, conducted by Warwick Braithwaite, HMV ED 441.

I liked this as well as any Joan Hammond release I have heard for quite a while. Her most noticeable role was Isolotta, but I don't think so. To my mind

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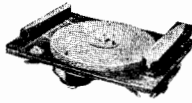
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...e does much better in Wagner at least in records. Her voice is probably not strong enough to sustain a full Wagnerian role in person, but these records have many good points.

Not at least is the fine orchestra support which does much to sustain the atmosphere without which Wagner is nothing.

To do Joan credit, she does not lack courage in her tackling of these famous arias so well identified with voices such as Austral's. Her many admirers will welcome this one.

CARNAVAL ROMAIN OVERTURE (Berlioz), played by the London Philharmonic Orchestra, conducted by Victor de Sabata. Decca 2902.

This overture is quite well known, and one of the most tuneful and colorful of them all. It requires more than mere brilliance to catch the changing moods—the mixture of sweet music, and wild, not to say violent, revelry.

All these things the conductor has managed admirably. On the first side there is finely controlled legato, although the break could have been more happily made.

The brilliant second half was completely to my liking, with that admixture of the devil which the music demands. The orchestra revels in the work, and when the London Philharmonic really goes to town, there are no half measures.

The recording is robust, deep throated and vivid. It may be something of a needle-smasher, but at least for the needle it's a glorious death.

In most ways—one out of the box for all tastes.

BRILLIANT BALLET

THE PERFECT FOOL—Ballet Music (Holst), played by the London Philharmonic Orchestra, conducted by Sir Malcolm Sargent, Z900-1.

There is some astonishingly good recording on these discs—definitely the F.F.R.R. touch, I should say, as clearly evidenced by the brass in the opening bars, and, for that matter, the cello and effects on the second side, which are as clean as a whistle.

The music is ballet to the core. There is nothing in its general pattern to give you anything you did not expect. The sounds portray very faithfully how you would imagine Sprites of the Earth, Water and Fire to behave—and how those Fire Sprites do get around!

However, I had my revenge—if I interpret the music correctly, they staged a big battle with the Water Sprites, who cleaned them up after a tough battle, and finally overcame them, and dissolved them completely in smoky drips.

As a ballet this should be most effective, and as programme music, it is just as good. Best played I should say with lightweight pick-ups. Tends to fall out a bit on the heavier passages.

A vivid interpretation of the "Ride of the Valkyries" (Wagner) completes the four sides. This has plenty of vim and a weight that will test everything you've got!

MORNING SONG (Bax), played by Harriet Cohen with orchestra conducted by Sir Malcolm Sargent.

Pleasant, nicely written music, adequately played and conducted. Dedicated to HRH Princess Elizabeth who, I am quite sure, was most happy over it. I think everyone will appreciate its charm and the neat orchestration that goes with it. That's all, I think.

Other Releases Include

COLUMBIA

VICTOR SILVESTER'S STRINGS FOR DANCING—"Flowers and Romance" and "Cote D'Azur." DO.3137.

DINAH SHORE WITH ORCH.—"Lazy Country Side" and "My Bel Ami." DO.3138.

VICTOR SILVESTER'S BALLROOM ORCH.—"I'm Still in Love With You" the "You That Used to Be" and "You've Got That Thing." DO.3135.

PETER YORKE AND HIS CONCERT ORCH.—"Till the Clouds Roll By" (Pts. 1 and 2). DO.3136.

BENNY GOODMAN'S SEXTET—"Ain't Misbehavin'" and "Shine." Benny Goodman (Cl.), Slam Stewart (Bs.), Mel Powell (Pno.), Mike Bryan (Gtr.), Morey Feld (Dms.), Red Norvo (Vibraphone). DO.3142.

DENNIS MORGAN WITH ORCHESTRA AND CHORUS—"One Alone" and "The Riff Song." DO.3139.

PETER YORKE AND HIS CONCERT ORCHESTRA—"Night and Day" (Pts. 1 and 2). DO.3140.

HARRY JAMES AND HIS ORCH.—"Feet Draggin' Blues" (Pts. 1 and 2). DO.3141.

VICTOR SILVESTER AND HIS BALLROOM ORCH.—"May I call You Sweetheart" and "I'm Trying So Hard to Forget You." DO.3143.

DINAH SHORE WITH ORCHESTRA—"Ask Anyone Who Knows" and "The Stanley Steamer." DO.3144.

H.M.V.

THE FOUR KING SISTERS WITH ORCH.—"Divorce Me C.O.D." and "A Man is Brother to a Mule." EA.3683.

SAMMY KAYE AND HIS ORCH.—"Serenade of the Bells" and "Ask Anyone Who Knows." EA.3684.

"FATS" WALLER (Piano Solo), "Rockin' Chair" and "Tea For Two." EA.3685.

THE THREE SUNS—"Hindustan" and "Sunrise Serenade." EA.3675.

DAVID ROSE AND HIS ORCH.—"In the Still of the Night" and "Love For Sale." EA.3676.

BETTY RHODES WITH ORCH.—"What Has She Got That I Haven't Got" and "The More I Go Out With Somebody Else." EA.3677.

NOEL COWARD WITH ORCH.—"Bright was the Day" and "His Excellency Regrets." EA.3678.

AL GOODMAN AND HIS ORCH.—"The Donkey Serenade" and "Giannina Mia." EA.3679.

JELLY ROLL MORTON AND HIS RED HOT PEPPERS—HMV Hot Jazz Classic No. 16—"Little Lawrence" and "Ponchartrain." Jelly Roll Morton (Pno.), E. Barefield (Cl.), B. Miley, W. Pinkett (Tpts.), W. deParis (Tmb.), Unknown (Bj.), B. Addison (Gtr.), B. Benford (Tuba), T. Benford (Dms.). (Recorded March 19, 1930). EA.3680.

BENNO MOISEWITSCH AND THE PHILHARMONIC ORCH. (Conducted by Basil Cameron)—"Concerto No. 2 in G Minor, Op. 22." EB490/2.

PATRICE MUNSEL WITH AL GOODMAN & HIS ORCH.—"Granada" and "Andalucia." EA.3681.

DUKE ELLINGTON AND HIS ORCH.—"What Am I Here For?" and "Sentimental Lady." EA.3682.

TOMMY DORSEY AND HIS ORCH.—"To Me" and "Gotta Get Somebody To Love." EA.3686.

BERYL DAVIS WITH ORCHESTRA—"The Best Things in Life Are Free" and "Wherever There's Me." EA.3687.

AL GOODMAN AND HIS ORCH.—"Duel in the Sun" (Pts. 1 and 2). EB.547.

PARLOPHONE

EDMUNDO ROS AND HIS RHUMBA BAND—"Blen! Blen! Blen!" and "Rio De Janeiro." A.7659.

JOE DANIELS AND HIS HOTSHOTS IN "DRUMNASTICKS"—"Drummer Boy, Drum" Part 1 (Quicksteps), Part 2 (Blues). A.7660.

THE ORGAN, THE DANCE BAND AND ME—"Daughter, Daughter" and "I'm Gonna Hold You in My Arms." A.7658.

COUNT BASIE AND HIS ORCH.—"Tuesday at Ten" and "Undecided Blues." A.7662.

DOROTHY SQUIRES WITH ORCH.—"I Get Along With Somebody Else" and "Unchangeable You." A.7661.

TEDDY WILSON'S SEXTET—"I Can't Get Started" and "Blues Too." A.7663.

DECCA

INK SPOTS WITH INSTRUMENTAL ACCOMP.—"Ask Anyone Who Knows" and "Maybe It's All For the Best." Y.6089.

BING CROSBY WITH CARMEN CAVALLARO—"How Soon (Will I be seeing you)" and "After You've Gone." Y.6087.

BOB CROSBY AND HIS ORCH.—"Take It Easy" and "The Mark Hop." Y.6086.

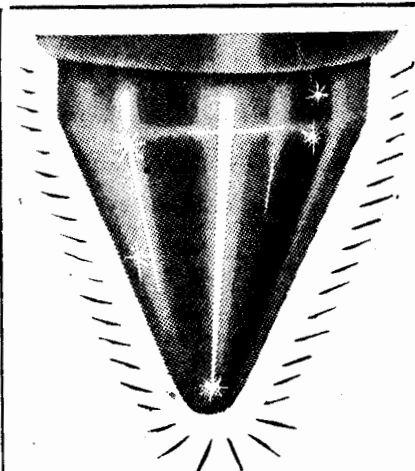
ART TATUM—"Sweet Lorraine" and "Get Happy." Y.6088.

GLEN GRAY AND THE CASA LOMA ORCH.—"Just An Old Manuscript" and "Blue Rhapsody." Y.6090.

REGAL-ZONOPHONE

REG LEWIS AT THE PIANO with Rhythm Acc.—**DANCE TIME MEDLEY No. 1.** Intro: (a) "One Little Kiss in the Moonlight"; (b) "The Overlander's Song"; (c) "I'm Going Back Home Next Christmas." **DANCE TIME MEDLEY No. 2.** Intro: (a) "Even the Stars"; (b) "Give Me Just Another Kiss"; (c) "It Wasn't a Star." G.25215.

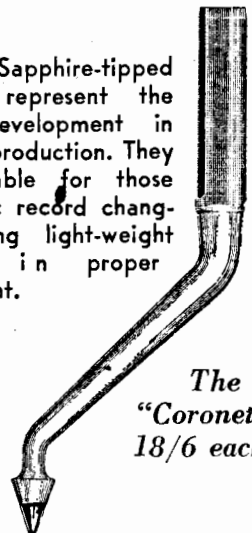
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ANSWERS TO CORRESPONDENTS

No Name (Strathfield, NSW) wants to know if it is possible to construct a two-valve set using a pair of 1J6-Gs.

A. Yes, although as a rule only one valve is used since the 1J6-G has two triode sections in the one envelope. One section is usually used as a detector and the other as an audio amplifier. However, should you desire to use the two valves you could use one section of the first valve as a regenerative detector, the other section as an audio amplifier, and both sections of the other valve in parallel as the output stage.

A.H.K. (Biggenden, Qld) advises us of a change of address and at the same time mentions that he has had good results from the "Fireside Five" as a car radio using an ex-disposals generator for the high tension supply. The set is housed in a steel case and the ignition interference is only slight.

A. Your new address has been passed on to the subscription department. Many of the military generators are of very good quality indeed and can be depended upon to give long and trouble-free service. Your kind wishes with regard to "Radio & Hobbies" are greatly appreciated.

K. McK. (Bondi Junction, NSW) writes in with words of appreciation for "R & H" and asks about three sets which he has constructed. He states that he was highly delighted with the results of the "Tom Thumb."

A. Very pleased to note your interest in the magazine, K. McK. Poor reception from 2FC could be due to a partially "dead spot" from that station in your locality. Pick-up terminals could be fitted to the "Little General" by switching the 1mf. coupling condenser to the grid of the 6V6G from the F terminal of the second IF transformer to one of two pickup terminals. The other pickup terminal should be earthed to the chassis. The switching should be done with a double-pole double-throw switch with one section switching the 1mf. condenser as mentioned above and the other section removing the screen voltage feed of the preceding valve when in the pickup position. A crystal pickup would suit best. With regard to the ECH35 converter, make sure that the broadcast receiver is tuned to the output frequency of the converter. We would suggest also that you check all the voltage points in the converter. Make sure also that, when switched to the converter, the aerial is connected to the converter aerial coil. Finally check the alignment of the converter.

T.J.R. (Hartwell, Vic.) renews his subscription and asks a question about short-wave converters.

A. Your subscription renewal and the

query on the magazine delivery have been dealt with by the subscription department. Yes, T.J.R., it is possible to use a short-wave converter on a number of bands by arranging for the switching of suitable coils or, more simply, by using plug-in type coils. Of course, there is a practical limit to the number of bands to cover beyond which a basic change in the design of the converter may become necessary.

C.R. (Leichhardt, NSW) writes in to tell us of the pleasing results which he has had with the crystal set described in the beginners' section of the February, 1948, issue of R & H.

A. Your letter was read with interest, C.R. The little set performed quite well

says he would like to see it on sale more frequently.

A. Thanks for your appreciative remarks, but there is no hope of publication at less than the regular monthly intervals. We note your request for the design of a receiver larger than the "Vibrogram Seven," but can make no immediate promises. We rather felt that the "Vibrogram Seven" was taking things far enough in regard to complexity, although we are quite open to be convinced otherwise if sufficient readers display their interest in a larger receiver.

J.M. (Dandenong, Vic.) asks a question on the "Minivox" set featured in the December, 1947, issue.

A. No, J.M., it is not essential that the speaker transformer be mounted on the chassis. It was mounted there as a matter of convenience and also because there was no easy provision for mounting it directly on the speaker.

J.W. (Orange, NSW) writes, with enthusiasm about the success he has had with "Monty plus Audio." He arranged the wiring of the audio end so that he was able to use a pickup with sufficient volume from the locals on an 8-inch speaker to fill a large room.

A. We are pleased to note your results with the set, J.W. and feel that our claims for the performance of this little set have been fully justified. An additional stage would logically be an RF stage. A circuit diagram of such an addition to a set is available through the 1/- query service.

J.C. (Dawn Siding, via Gympie, Qld.) has a super-regenerative receiver operating on the 50mc. amateur band and he sends in details of interstate stations he has heard recently. The aerial is a half-wave dipole 20ft. above the ground, and can be used in either a vertical or horizontal position.

A. Many thanks for the report which was read with interest. We have been doing quite a bit of work on the band lately and will pass your report on to the stations concerned.

B.W. (Mackay, Qld.) comments generally on the use of R.F. chokes in small sets and refers in particular to a circuit in the December, 1947, issue.

A. Although it is possible in some cases to arrange a detector circuit to eliminate the need for an R.F. choke, this component is usually necessary. The series circuit suggested in your letter still requires a choke for complete reliability of operation. As it stands, the high frequency current through the reaction coil, and therefore the feedback, is determined partly by the setting of the reaction condenser and partly by the stray capacitances in the plate wiring, the leads to the phones and across the phones themselves. Because of this the performance of sets using the same circuit is likely to vary widely and, in the worst cases they may be uncontrollable. In designing circuits for general use we have to eliminate as far as possible all these random conditions, even though one or two additional components may be required to achieve this result. The mere fact that the elimination of one of these components in a particular set may not affect results does not in itself indicate that its inclusion in the original design was unwise.

T.T.M.C. (Auckland, NZ) is especially appreciative of recent articles on the "5" C.R.O. and suggests that the subject be followed through with articles covering such devices as electronic switching and a wobulator for alignment purposes.

A. We are glad to note that the articles proved so useful and that your own instrument was a complete success. It is intended to give further information on cathode ray oscillographs and their use, but time and space will determine to what detail we can go. The additional instruments you suggest are of more specialised character and we obviously have to draw a line when it appears that too much time is being spent to meet the needs of too few readers.

THE following reprints are available on application at our office, 60-70 Elizabeth-street, Sydney. They will be sent, post free, on receipt of stamps or postal notes.

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in receiving all the locals and also Radio Australia from stations VLB and VLC7. Your 100ft. aerial would aid reception and you are lucky to be in a spot where such a long aerial is a proposition.

L.V.S. (Wellington, NZ) asks if we have available a circuit of a 110 volt AC/DC broadcast or dual-wave receiver.

A. Yes, L.V.S., we have available the circuit only of a 4/5 valve receiver for operation from 115 volt AC/DC supply. A dual-wave coil unit could be used with this receiver. An RF stage could be added quite easily, the only adjustment to the present circuit being a small reduction in the value of the heater dropping resistor. This circuit is available through the query service for the cost of 1/-.

B.E.C. (Tomingley, NSW) writes in appreciation of "Radio & Hobbies" and

HOW TO SUBMIT YOUR QUERY

1. Queries will be answered in rotation through the columns of our magazine if not accompanied by a fee for a postal reply.
2. Queries, neatly and concisely set out, will be answered by mail as quickly as possible if accompanied by 1/- in postal notes or postage stamps. Endorse envelope "Query."
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 exact size chassis layouts with all essential holes and cut-outs will be supplied if available for 2/6. Endorse envelope "Blueprint."

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ANSWERS TO CORRESPONDENTS

H.S.M. (Bridgetown, WA) sends in some suggestions, and his views on our paper's response to the February editorial.

A. Many thanks H.S.M. for your interest and your letter. All your suggestions have been noted and you can rest assured that we will do our best to please. The reason we use modern components in six-meter gear is that the older valves and circuits are not capable of anything like comparable performance. Standard receiving valves, even though they will work on "six," are really only useful up to about 30 m/cs. Valves such as the 954, 955, GAK5, GACT, &c., make all the difference between a good set and one that just works after a fashion. As far as receiving antennas for the band are concerned, the requirements are exactly the same as for transmitters. In fact, most amateurs use the same antenna for transmitting and receiving with a switch of some sort to change from one to the other. We suggest you read the chapter on aerials in the Shortwave Handbook and also those in the standard overseas amateur handbooks.

K.P.W. (Ardrossan, SA) sends in a year's subscription and also details his experiments with receivers over the past few years. He uses a set with two tuners and a common audio amplifier. It is arranged so that the amplifier can be switched quickly from one tuner to the other. This makes it possible to listen to two stations in communication without the necessity for retuning. He is able to hear the two-way conversation between the pilots of aircraft and ground stations.

A. Many thanks for the subscription. We read your letter with a great deal of interest and we are sure that other readers will also be interested in the scheme outlined above. A possible cause of the difficulty with the regenerative set is audio instability. The bypassing effect of the reaction condenser may be sufficient to cure the instability when the plates are in mesh. The cure for this is to bypass the reaction circuit to earth for the higher audio frequencies by means of an R.F. choke in series with a 0.00025 condenser. Many thanks for your appreciative remarks with regard to our magazine.

S.D.C. (Brighton, Vic.) writes to congratulate us on Radio and Hobbies, which he feels is comparable with any of the overseas publications. Despite his senior years, he finds the "Junior Experimenter" articles very interesting. At the moment he is completing a communications receiver with a view to becoming a short-wave listener.

A. Your letter was read with interest and the contents noted. We sincerely hope the receiver turns out a success. Here in Sydney, at any rate, coil winding wire is available in small quantities. We are not familiar with the situation in Melbourne. "How to collect Verification Cards" should have reached you before you read this.

F.O.L. (Brunswick, Vic.) is very interested in the subject of amplifiers but does not know which one to choose of the designs described in recent years.

A. For sheer fidelity, as revealed by laboratory tests, the new "807 Triode Amplifier" is probably the best design. It certainly sounds very good to listen to. However, the point is that most of our amplifiers are designed to have good electrical qualities and their fidelity and distortion content is much lower than that which can be expected from records, pickups and loudspeakers. It is therefore, rather futile to expect a startling difference between amplifiers while these limiting factors exist. Some of the newer pickups are capable of very good results, provided the discs are good and there are speakers in existence which will handle effectively the wider range of frequencies. From an academic stand point it is comforting to know that the amplifier is as near perfect as it can be made but, under present circumstances the difference between it and one of less ambitious design may not be immediately apparent. It is just a matter of how much weight you attach to academic considerations and how much money you are prepared to spend on expensive equipment. The matter of stereoscopic reproduction is quite distinct from questions of fidelity. The effect is largely an illusion but we still like it and favor the idea of an amplifier system with the highest possible fidelity and a loudspeaker system giving a stereoscopic effect.

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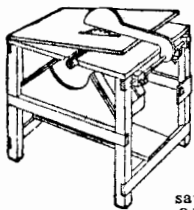
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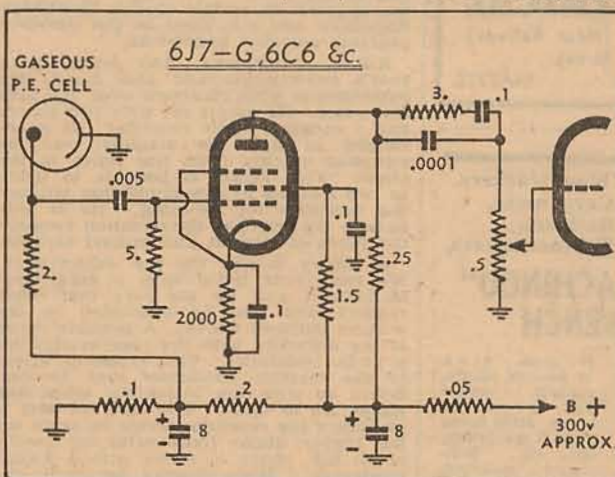
To judge by our mail, quite a few readers are apparently interested in sound-on-film reproduction. Here is the answer to the oft-repeated question . . . What preamplifier is necessary for a P.E. cell?

THE actual output from a P.E. cell varies tremendously according to the type of cell, the efficiency of the optical system and the nature of the film itself. In general, however, sufficient gain will be available if a single high gain preamplifier stage is connected ahead of an amplifier system with the usual 0.25 volt input rating for full output.

Obvious choice for the preamplifier

connecting lead should be as short as possible and not be made in ordinary shielded wire. Best choice is a short length of low-loss low-capacity microphone cable, or co-axial cable now so readily obtained from disposals sources.

Another possibility is to pass the "hot" conductor through a flexible metallic tube, which acts as the outer shield. However there is a danger of severe microphonic trouble with this method.



valve is the 6SJ7, 6J7-G or a similar pentode. Of special interest is the low noise type 1603. The operating conditions for the valve itself are quite normal.

The chief problem in a sound-on-film system is to avoid loss in the treble register. With this in mind, the scanning beam of light on the film should be adjusted to give the finest possible beam, and the brightest. For this purpose, attention should be given to the focusing adjustment and to the position of the exciter light in relation to the condenser lens. Inside the optical system, the rectangular slit should itself be free from fluff and dirt.

A second important point is to avoid losses due to capacitance in the connecting lead between the P.E. cell and the grid of the preamplifier valve. The

The coupling between the pre-amplifier stage and the main amplifier should favor the treble frequencies. The coupling condenser can therefore be made quite small — no more than .001 mfd. for a typical case. An alternative, which has been found satisfactory in a home-built system is shown in the circuit. The small .0001 mfd. coupling condenser passes the extreme treble without loss, while the combination of the 3 meg. resistor and 0.1 condenser passes the lower frequencies at reduced level without eliminating them altogether.

Experiment with this interstage coupling network for best results, particularly on male speech.

Most gaseous P.E. cells have a critical maximum voltage limit of 90 volts, and this is provided conveniently by the decoupling network using a 0.1 meg. resistor, a 0.2 meg. resistor and a 2.0 meg. load to the cell. The 8 mfd. condenser filters possible hum from the supply and is also a precaution against motor-boat effects.

All voltages will work out satisfactorily if the high tension supply voltage is about 300 volts, as suggested on the circuit.

ANSWERS TO CORRESPONDENTS

D.P. (Essendon, Vic.) writes to congratulate us on Radio and Hobbies. Also he would like to know where he can obtain the circuit of a multimeter.

A. Many thanks for your letter and kind remarks. A circuit such as you require is the R. and H. Check-meter. The DC version was described in the November, 1946, issue, while the AC/DC version was detailed in the December, 1946, issue. Both of these circuits are available through our shilling query service.

L.M.S. (Armidale, NSW) found the 5Y3-GT handy in conserving space in the "Little General."

A. Yes, L.M.S., the smaller physical size of the GT series valves has proven of great assistance in the constructional side of radio. Your subscription has duly been attended to.

J.S.P. (Cairns, Q'ld) wishes to use some parts he has on hand in the "Fireside Five" of the August, 1946, issue.

A. It is quite in order to use the 6K8-G and the 6B7 instead of the 6J8-G and the 6B8-G specified. The only change necessary to the circuit is to tap the high tension for the oscillator plate of the 6K8-G down to the 100 volt point on the voltage divider. The 6B8-G is identical to the 6B7, the only difference being the base. You could use the speaker with a resistor in series with the field coil and the higher voltage transformer as you suggest. The speaker field dissipation would be about 5 1/2 watts, which is a little on the high side but probably not excessive. Many thanks for your kind remarks and we are glad to know that you like the "Serviceman Who Tells" feature.

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ANSWERS TO CORRESPONDENTS

A.R.T. (Flinders Park, SA) sends in his subscription and at the same time mentions that he has modified several "Radio and Hobbies" designs to suit his exact purpose.

A. Your subscription has been passed on to the appropriate department and will be attended to in due course. Yes, we agree that some readers may want to make alterations to our designs to make them suit the job, and the parts available. We therefore, often mention substitutes for the benefit of those who may not be sure about these points.

H.L. (Bundaree, Vic.) renews his subscription and suggests that, if articles have to be cut or reduced due to the paper shortage, we treat the article "The Serviceman Who Tells" favorably.

A. We thank you for your subscription renewal, H.L. The way we see it at the moment, the effect of the paper shortage should not be detrimental to the articles. "From the Serviceman Who Tells."

R.C. (Nth. Balwyn, Vic.) asks some questions on "Little Jim II" and its use with the "Vox Major" amplifier.

A. We thank you, R.C., for your good wishes to the magazine. The "range" of receivers cannot be quoted with any degree of accuracy because of variation in reception conditions, stations, aerials, &c. However, with a suitable type of aerial coil with a reaction winding, it should be possible to receive all local stations when operated in the metropolitan area. The Little Jim II could be fed into the Vox Major if the headphones were replaced by a resistor of say 50 megohms the plate end of which would be coupled to the amplifier via a .05 mfd. or a 1 mfd. condenser. The leads between the set and the amplifier should be as short as possible as instability may otherwise occur. If longer interconnecting leads are required, shielding of the leads will be necessary.

H.L. (Kalgoorlie, WA) sends in a subscription and asks us to comment on converter circuit he encloses. He is also interested in grounded grid triode R.F. amplifiers.

A. Your converter circuit would be quite OK under the conditions you propose. The methods of obtaining the bias for the 6SA7 is open to query and you may do better with conventional cathode bias. We are aware of the advantages of the grounded grid triode type of R.F. amplifier and may find time to consider the matter further in the near future. However, the conventional high slope pentode is capable of such a good performance up to 100mc that it is a matter for debate whether the triode scheme is worth while at the lower frequencies.

N.E.J. (Gulgazambone, NSW) says that he would like to see featured a 6 or 7 valve radiogram receiver for operation from 32 volt supply.

A. A receiver of this type, though not necessarily featuring radiogram facilities, has been in mind for some time, though we are not able to make any promise of publication just yet. To the best of our knowledge, there are no gram motors available at present for operation from 32 volts.

H.W. (Mackay, Qld.) expresses his appreciation of articles of engineering interest, but suggests that we should make a much more lengthy statement of the reasons for various component values and circuit practices.

A. Your letter was read with considerable interest and we note your sentiments about the popular science, aviation and general engineering pages. The proportion of space given these subjects has been somewhat reduced in favor of articles with a radio interest, but we do not feel disposed to eliminate these articles from the magazine. We quite realize that a lot is not said in our beginner articles. Chief difficulty is always lack of space. If one were to pause to explain all the aspects of a particular circuit the resulting article would monopolize the magazine, or attempt to do so, spread over so many issues that it would tend to monotony for readers not directly interested in the matter. Nevertheless, there is quite a deal in what you say and we will bear your remarks in mind.

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SELL: 1 pair 40,000 ohms headphones, 2 single gang condensers, 4 terminals, all brand new, lot for £2. Small speaker, used, £1. Write B. Dussen, Farm 256, Yoogali, via Griffith, N.S.W.

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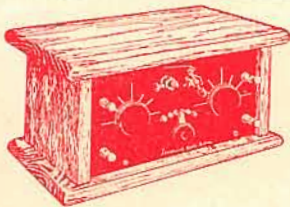


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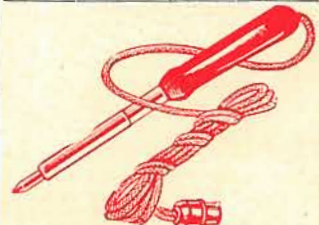
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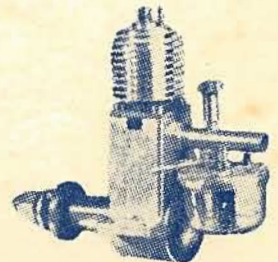


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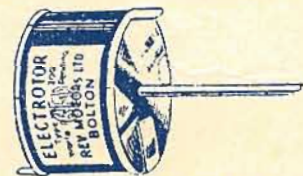
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