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NEW TV STATIONS

RUNNING a couple of months behind schedule, in most cases, the first of the “phase 3” television stations is currently testing, preparatory to going into full-scale operation. These stations will serve the more populous country centres and some of them will overlap into the already solidly established capital city viewing areas.

In favourable locations in Sydney for example, signals should be available from the transmitters in both Newcastle and Wollongong. Inevitably, appearance of the new signals on the air is going to cause some consternation, as the heritage of the Broadcasting Control Board’s “mid stream” switch from 10 to 13 channels. Though the implications have been apparent for a considerable time, many country viewers are suddenly going to realize that, although their present sets will still receive the distant city stations, they will not pick up the new locals.

There would appear to be some handy pickings ahead for those television service organizations which can undertake replacement or modification of existing tuners. But here a word of warning: There is more to the operation than merely changing over a few coil “biscuits” or even a complete tuner. If receivers are to go back to their owners with properly adjusted bandpass and acceptable picture resolution, accurate tuner and overall adjustment will be necessary. Many service organizations are just not set up, at present, to do this.

The provision of new “local” aerials and possible receiver overload are other problems which viewers in these new areas will have to face and service personnel will need, at the one time, to be salesmen, technicians and diplomats.

In the capital city areas, the opening of new country services is likely to have a significant impact. While it may not be strictly necessary to look in on transmitters carrying the same familiar program titles, I imagine that many will want to do so, if only because of the Joneses next door. That is something the implications have been apparent for a considerable time, many country viewers are suddenly going to realize that, although their present sets will still receive the distant city stations, they will not pick up the new locals.

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THE AKAI MODEL M6 TAPE RECORDER...

The discriminating buyer who wants professional fidelity at a reasonable price will do well to study the impressive list of specifications. Any doubts we may have had as to the accuracy of the specifications were quickly dispelled during our bench test when the machine measured up to every specification claimed by the manufacturer.

The Akai M6 is a four track stereo recorder with advanced specification and styling. This unit can be used vertically, or horizontally. It will accept all spool sizes up to 7"in, three speeds 12in, 15in and 30in/second. This latter speed is incorporated in the machine for quality copying from one machine to another. The ability to operate with no pressure control to external pre-amplifiers or a tape head characteristics. The four track system is similar to a chain of gears but is much smoother and requires no lubrication. The signal in noise ratio is better than —45 db. The deck is controlled by two large levers, one for replay and one for record when a red safety button is depressed; the other for fast forward and reverse. These controls are synchronized and are positive. There is a pause control which locks in the stop position when required. Speed change is by a lever mounted between the spools. There is a three digital numbering system on the left hand side of the deck.

Specified on the track selector are the track head characteristics. The playback head has an impedance of 5,000 ohms, cross talk better than 85 db, and a frequency response of 20 to 20,000 cycles per second.

The Akai M6 is fitted with two separate amplifiers which are identical. They are plastic molded "left" and "right" and the upper "left" of the two drives controls both the replay and the recording machine, for monitoring purposes. Each amplifier is fitted with a 7"M modular, all-transistor type in clear plastic which lights up when the amplifiers are switched on. The amplifier panels are fitted with both full and part time, a premagneto microphone contact control, a power control, a tape speed control, a volume control, a large bass control, in which is incorporated a pole position switch for frequency correction for 15in and 30in/ second, plus an input from the microphone or external speaker socket rated at 4 ohms.

Each microphone or external speaker socket which is direct connection to the output from the playback heads for connection to external pre-amplifiers or a tape recorder. The microphone is designed for normal use and the manufacturer claims 6 watts per channel. The frequency response is 40 to 14,000 cycles per second at 15in per second and 50 to 20,000 cycles per second at 30in per second. Such facts or minus 3 db. The cross talk is plus minus 80 db.

The complete range of sound Industries are compiled by the Technical Division of Magnetic Sound Industries. This test report was compiled by the Technical Division of Magnetic Sound Industries.

The complete range of Akai Tape Recorders are available from Magnetic Sound Industries with an emphasis on high-fidelity enthusiasts, radio professionals who will enjoy the utmost satisfaction from this model, because of its breath-taking performance, advanced features and styling. To sum up, this unit will find a ready application with high-fidelity enthusiasts, and audiophiles and radio professionals who are particularly selective. The Akai M6 is certainly one of the most attractive and well designed stereo recorders available. It is a most attractively styled pair of loudspeakers contained in a wedge shaped cabinet, which when closed, together with the "left" and "right" are precisely the same size as the rear Speakon cabinets, which when clipped together bring the total price for the complete unit to £130/—.

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THE NATIONAL MODEL RS772 RECORDER

When thinking in terms of value, quality and price go hand in hand; and in this respect the National rates highly.

The RS772 is the largest and most comprehensive of the three National tape recorders; it is a four track stereo recording and playback machine with three heads and twin speakers. It will accommodate all machine with three heads and twin spool sizes up to 7in in diameter, and full length control panel on the front of the machine.

On the left-hand side of the panel are two sensitive rim set VU meters, one for each channel, together with a warning light to indicate the machine is switched on. Then there are six piano type keys to operate the deck, and on the right of these are two selectors, indicating channel functions. The deck is switched on by pressing the following order: Wind, Stop, Fast Forward, Playback, Record and Pause. An interesting feature on this machine is that when it is switched off, the function key last pressed flies back, and it is not possible to leave a key down and accidentally damage the machine by leaving it in this position.

In front of the panel are twin volume and tone controls, and a master playback volume control incorporating the on/off switch. On the right-hand side is the function selector switch. On top of the panel is the speed selector switch, and a digital digital counting counter. An auto-stop device is fitted, which operates when either head operates. The machine is fitted with three heads, a stereo erase, stereo record, and stereo replay, and they have been so arranged that it is possible to record one channel while playing back the other.

The function switch gives the following possibilities: stereo record; stereo replay; playback channel 1 or 2; or 3; playback channel 2 or 3 whilst recording 1 or 2; or 3. This is commonly called sound on sound or multiple recording and will find many applications for the disc, the pop group, television, and particularly for the musician, in that it is possible to work simultaneously on one track, and then listen to this recording while making a second recording. This will enable a record to be made of many instruments played by the one musician. As each function is selected, so the choice is indicated by an illuminated panel. The machine will not record on the other channel while playing back the first, until the recording key is also depressed. The machine will, of course, also playback half track stereo, half track monaural, and full track monaural, in addition to its normal quarter track functions.

On the side of the National is a short M-J line on lead to the line in on the other. Two audio copy leads are supplied, fitted with National plugs at one end, and wander plugs the other. Two line outs, 2.3K (unbalanced) cathode followers, are available for external amplifiers (through cathode followers). Two high impedance output jacks for external amplifiers (through cathode followers), which is unusual except in hi-fi systems; and two output jacks for external speakers. There are two microphone sockets, to accept standard monaural or stereo microphones, and two further microphone sockets, to accept standard microphones, to supply four separate channels, and thus it comes as complete package for stereo reproduction and recording.

The National is an easy machine to operate, and we have made some excellent stereo recordings with it. The individual VU meters are easy to read, and it is possible to record through the internal loudspeakers or with the playback volume control. Two audio copy leads are supplied, fitted with National plugs on one end, and wander plugs the other end to take care of most eventualities.

There is also a short lead with a special application: It is possible to record from one track to another. To do this one connects Piccadilly head to the line in on the other.

To sum up this new addition to the National range offers exceptional value, and may well prove to be a yardstick by which other manufacturers will judge their machines.

This test report was compiled by the Technical Division of Magnetic Sound Industries. The complete range of National Tape Recorders, is available from Magnetic Sound Industries, the Technical Division of Magnetic Sound Industries. The complete range of National Tape Recorders, is available from Magnetic Sound Industries.

SPECIFICATIONS:

- Power supply: 100-120 volts, 60 cycles.
- Consumption: 7 watts (stereo), 4 watts, mono.
- Taps: 3.5, 7.0, 14.3, 35.0, 85.0, and 165.0K (unbalanced).
- Inputs: 2 high-impedance (100-600K) 2 low-impedance (20K)
- Outputs: 2 extension speakers, 8 ohms.
- Frequency response: 50 to 60 cycles.
- Volume response: 90 to 15,000.
- Weight: 45-50 lbs.
- Dimensions: 15 1/2" x 17 1/2" x 8 1/2".
- Rewind time: Within 5 minutes for a 7 1/2 reel of 1200ft tape.
- Valve: 2 x 6267 (EFS6), 2 x 12AX7, 5 x 16A8, 2 x 12AU7.
- Frequency: 7-8/sec. 50 to 2,000 c.p.s.
- Volume: 6 watts (stereo), 3 watts (monaural), 1 watt (mono).
- Dynamic range: 80 dB.
- Cross-fade: 80 dB at 1,000 c.p.s.

This last report was compiled by the Technical Division of Magnetic Sound Industries. The complete range of National Tape Recorders, is available from Magnetic Sound Industries. The complete range of National Tape Recorders, is available from Magnetic Sound Industries.

SYDNEY AND WOLLONGONG

387 George Street, Sydney 4B 3371-6
Piccadilly Centre, Wollongong 2 5223
The idea of a guided missile dragging its own control cable behind it may appear somewhat crude in this age of radio control, but the scheme has many advantages. It offers a useful range, freedom from jamming, excellent accuracy, a high order of reliability, and calls for very little special training. It has reached the stage of demonstration under simulated tactical conditions.

IN 1957 Vickers-Armstrongs (Aircraft), Ltd. initiated the development of an anti-tank weapon for infantry use which was intended to be light enough to be carried into action by one man. The vehicle and container/launcher weigh 441b and the guidance unit another 61b. For the warhead there is available 36 per cent of the launch weight, closely a stone, but it should be realised that the makers offer only the delivery system; the provision of a warhead is the purchaser’s responsibility. While an automatic-controlling charge is in existence the “Vigilant” has ever flown with one.

The propellant charge is a cigarette-burning double-base (i.e. cordite) cast made by Imperial Chemical Industries, Ltd.; it is smokeless, and supplies not only the nozzle (with an initial peak due to a sharply convex rear face) but also the turbo-alternator and the control surface actuators. A separate small and
relative cooling that burns up the grass. Finally, the striking flare is mounted at the projecting nozzle.

The vehicle flies at about 500 ft per second, and the control is capable of imposing an angle of attack of up to 90°, corresponding to 2g. The trailing wire, stowed around the skirt at the base, is 1,700 yards long. The radio-controlled version originally projected was to be 3,000 yards long, but this has been reduced to 1,700 yards by a system of shortening with a view to limiting the risk of grazing the ground. Two operators only are required. A switch is provided to command an initial rate of turn to either side, in addition to the initial perpender to level flight, when targets well to one side of the launch-ax is to be engaged.

DEMONSTRATION

In a demonstration to invited spec-
tators at the School of Infantry, Wex-
mister, W.1.1., two operators were
landed from a Sud-Aviation "Alouette" II helicopter, each carrying a "Vigilant" in his hand and a control unit in the other. The men had opened the car-
ter, set them up as launchers, and con-
ected the control wires ready for firing within 70 seconds.

A number of "Centurion" tanks, gen-
erally accompanied by an anti-aircraft gun, were trained to engage targets at ranges between 1,350 yards and 400 yards. In two cases the targets were plac-
ing and were followed by second shots because of the highly directional nature of the shaped charge warhead. The one miss was due to a breakage of a trailing wire, which is found to occur roughly once in 1,000 shots.

It appeared that one at least of the two operators was using the sight-controller, to the missile. The man had opened the car-
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BEFORE YOU BUY — A SOLDERING IRON

With a soldering iron you require many things — speed, efficiency, quality, economy, safety — these and other vital factors should be checked before you buy.

QUESTION | ANSWER
--- | ---
1. Which iron heats fastest? | Scope is ready for use in seconds (try it!).
2. Which iron can be used directly on the chassis? | Because the heat is concentrated at the tip, Scope does not suffer the "heat drain" of lesser irons.
3. Which iron is easy and inexpensive to repair? | The element and tip of Scope exist only a few pence and can be replaced in minutes.
4. Which iron is most likely to cause accidents? | Scope operates from 3.3 V — a medically safe. Not only in use, it is least likely to cause burns.
5. Which iron serves two purposes? | The factors in (3) allow Scope to be used equally well for confined electrical work or major projects, e.g., household soldering.
6. Which iron can be used in draughty locations? | Again, as in (3), Scope does not lose its heat to surrounding conditions.
7. Which iron has been the symbol of quality for ten years? | Literally hundreds of thousands of Scope Irons are in constant use — all owners are very satisfied (ask one!).

WHEN YOU BUY — BUY SCOPE

SCOPE STANDARD SOLDERING IRON

*A Soldering Iron I.Q.I.

SCOPE De Luxe SOLDERING IRON in re-usable Pouch Wallet

Make sure you get a genuine National-Scope Transformer.

AFTER YOU BUY — You have the personal satisfaction that comes when you own the best.

( THE FULL GUARANTEE ONLY APPLIES WHEN THE IRON IS USED WITH THIS TRANSFORMER )

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202 BELL STREET, PRESTON. 44-0491

6 Radio, Television & Hobbies, March, 1962
New Australian Industry — PETROCHEMICALS

Most people tend to think of the petroleum industry only in terms of petrol and lubricating oils, with the vague idea that there are some useful "by-products" as well. In fact, the "by-product," or petrochemical industry as it is now called, is a vast one touching almost every phase of modern industry. The production of carbon black—a vital commodity in the manufacture of motor tyres—is just one small phase of it, yet is a major Australian industry in its own right.

At the end of World War II, Australia had only two small oil refineries which met but a fraction of the country's requirements of petroleum products. The Australian economy was on the verge of great expansion and both Commonwealth and State Governments were quick to realise that the establishment of an oil refining industry of sufficient capacity to meet most of the country's requirements of refined products would be a stimulus to national development.

Australia's oil refining industry is able today to meet 90 per cent of the country's requirements of refined products and, in addition, it provides large quantities of products for export which, in the year ended June 30, 1961, were worth $22 million.

Most of the benefits expected from the establishment of an oil refining industry have materialised. Although oil has not yet been found in commercial quantities, Australia's refineries are saving the country £35 million a year in foreign exchange, providing direct employment for more than 4,500 people and supplying the fuel to meet 39 per cent of the country's energy requirements.

Australia is now reaping another important advantage of having its own refining industry for from this has stemmed a number of enterprises for the manufacture of petrochemicals. The manufacture of chemicals from petroleum dates back to the last years of World War I when the petrochemical industry had its beginnings in the United States but it was not until World War II that the manufacture of petrochemicals achieved any great significance.

Most countries that have an established oil refining industry are also developing a large petrochemical industry because the feedstocks for the manufacture of petrochemicals are on hand in large quantities and at low cost. Australia did not enter the field of petrochemical manufacture until about four years ago, but now has 19 petrochemical plants either in operation or under construction. They represent a capital investment of more than £60 million.

One of the early entrants into petrochemicals in this country was Australian Carbon Black Pty. Ltd., a subsidiary of the United States companies, Cabot Corporation and United Carbon Co. Inc. Early in 1956 it was announced that Australian Carbon Black would build a plant in Australia and by mid-1959 production had commenced at Altona, 11 miles from Melbourne. Up to that time Australia was importing about 14,000 tons of carbon black a year, mainly from the United Kingdom.

The Australian carbon black factory, built at a cost of £7 million, was designed to produce 15,900 tons of carbon black a year. This year the plant was duplicated to double its capacity. Carbon black is a general term given to finely divided carbon—a form of carbon which is used in the production of various products such as rubber, plastics, and paint.
ASSEMBLED AND TESTED—IN HALF THE TIME

Equipment manufacturers can now reduce the assembly and test time for wound coil assemblies by as much as 50 per cent by including Mullard Vinkors, the world’s most efficient ferrite pot cores, in their equipment designs. No grinding of cores is necessary to obtain accurate inductances. The inductance of coils to be wound can be predetermined to within ± 5 per cent of the value required. After the coils are assembled and mounted, a final adjustment to an accuracy of better than 0.02 per cent can be achieved by the self locking adjustor.

Contact Mullard for full details of the wide range of Vinkors, which cover frequencies between 1 Kc/s and 3 Mc/s.
Carbons present in mineral oils or natural gas in conditions where combustion is incomplete.

There are several main methods of transforming carbon black and each results in a different type and morphological grain of black. The method of manufacture used at the Alkali plant is known as the oil-furnace process.

A gas-furnace process has been used for making carbon black for almost 40 years but was not until 1945 that the oil-furnace method was introduced. The gas-furnace process uses natural gas or raw material but in the oil-furnace method the raw material is usually a heavy residual oil derived from oil refinery crack streams.

Use of the oil-furnace process quickly became widespread because of its high efficiency and versatility. Now more than half the world's supply of carbon black is made by the oil-furnace method.

**FIRST STAGE**

The first stage of the process consists of cracking the heavy oil at high temperatures in specially designed enclosed furnaces. Black-laden gases which are given off are then cooled to about 500 degrees F, before being passed through a series of cyclone separators and fibre-glass filter bag complements which remove the carbon from the gas stream.

The carbon is then further processed to increase its density and is pelleted for packaging and marketing.

By far the most important attribute of carbon black is its ability when mixed with rubber to impart to it desirable strength and resistance to abrasion. In other elements or compound has so far been discovered which is as effective for this purpose as carbon black.

Many other uses of carbon black rely on its extreme tenacity and great insulating properties.

Man has used carbon black for more than 2,000 years, producing in crude form of carbon soot for the purpose of writing and drawing. Originally the soot was made by burning vegetable or animal materials. Then the black industry really began in 1772 when the first commercial black was produced in West Virginia. It used natural gas as raw material to produce carbon black from what is now known as the channel process.

Subsequent construction of natural gas pipelines to supply large quantities of gas to industrial centers forced the carbon black industry to move to Louisiana. Eventually the industry had to move again—this time to Texas—and from about 1929 until recent years almost 70 per cent of the world's supplies of carbon black came from Texas.

The United States was in fact virtually the world's only producer of carbon black until about 11 years ago. Carbon black plants have been built since then in Canada, England, Australia, France, West Indies, Italy, Holland and many other countries. The United States now has less than 50 per cent of the carbon black production capacity in the free world.

Another major change in the industry is that the last decade was the swing from coal to oil as the most used raw material. More than 60 per cent of carbon blacks are now made from oil and 40 per cent from natural gas. Less than 10 years ago the ratio was the reverse.

The carbon black industry for nearly 15 years has had a comparatively small market for its products. The early blacks were used mainly by the printing ink and carbon coating industries and it was not until 1944 that carbon black was first mixed with rubber.

By 1950 carbon black was the most important reinforcement ingredient in rubber tyres and accounted for about 85 per cent of the world production of carbon black goes to tyre manufacturers.

**VAST IMPROVEMENT**

It is a process that displays most strikingly the remarkable reinforcing ability of carbon black. Before blacks were used in the manufacture of motor tyres the average life of a tyre was about 3,000 miles. The modern tyre which contains about 30 per cent by weight of carbon black has a life of approximately 20,000 miles.

Carbon black is used also in the car-car, tread base and side walls of motor tyres and in the inner tubes. Each section of a tyre has its particular requirements. For instance, resistance to abrasive wear is essential in the tread, and in the side walls low heat generation and resistance to cracking are of major importance.

Carbon black is made in different grades or particle sizes to meet these individual requirements. For instance, blacks of the finest particle size give maximum reinforcing properties and provide rubber with maximum resistance to abrasive wear, but these fine blacks also decrease the elastic properties of rubber. They are mixed with rubber to make a compound with either high electrical resistance or good conducting properties.

**One use for carbon black is in the making of plastics, including the plastics used for gramophone record masters. This picture shows a record master being cut.**
“Mikroport” is a small portable microphone system using an FM radio-link in place of connecting cables between the microphone and its associated amplifier.

The absence of yards of harassing microphone cable and the high-quality audio signals produced by the “Mikroport” make it ideally suitable for entertainments, stage and studio productions. Without microphone cables greater freedom is obtained in lecture-halls, schools or opera-state functions.

In industrial premises there is no need for long microphone cable when the “Mikroport” is used for relaying instructions or messages.

At sporting fixtures the announcer is free to move quickly from one vantage point to another when he has a small cableless “Mikroport.” Not being hampered by the length of microphone cable is especially useful to an announcer at car or boat races.

MANUFACTURERS SPECIAL PRODUCTS PTY. LTD.
47 York Street, Sydney. Phone: 2 0233

Adelaide: Newton McLaren Ltd., and AWA Offices in all the other States.

Radio, Television & Hobbies, March, 1962
A space-glider model recently withstood the first tests in Project Dyna-Soar space. Fifteen tests were made. Jutting from a thick steel wall in Boeing's Seattle factory were sections of Rene 41, a nickel-base superalloy, of which becomes the hottest part of re-entry vehicle, was made of HS 25, a cobalt-base superalloy. The rest of the test glider was made from HS 29, a chromium-aluminum alloy.

Boeing testing of individual structures showed Rene 41 had been strengthened against stress corrosion, and HS 25 had good creep characteristics. That is, HS 25 retained its shape better under extreme temperatures.

The acoustical tests, in which structures of the wing skin tested at high noise levels, were conducted at room temperature by Boeing engineers in Seattle.

A space glider will be subjected to noise loadings only during boost (ignition noise) and landing (aero-dynamic noise). Temperatures of the glider during three phases will not exceed 500 degrees F. The physical properties of Rene 41 and HS 25 are not changed significantly at temperatures below 500 degrees, so the acoustical testing was done, since these structures are tested at 10,000 psi.

A corrugated skin panel of Rene 41 was subjected to an alternating breaking noise at a level of 95 decibels (a level at which the human ear would be damaged in 10 minutes) and 155 decibels, plus 10 minutes at 160 decibels. The tested skin panel finally failed at some spot-welded points.

Building a space glider of selected superalloys metal requires many long cycles of testing. Unless the structure is strengthened and corrosion is reduced, the installing metal will not function. The glider is tested at severe temperatures as the temperature jumps from far below zero to as high as 2,000 degrees from friction when the craft re-enters the earth's atmosphere.

To accommodate heat expansion, the Boeing glider has flexible joints in each wing, in the glider body and on each side of the body where it meets with the wing. Pasting these joints from superalloys meant learning some new things about machining. The material being ground away was almost as abrasive as the grinding tool. To machine a main vane from Rene 41 first required more than 106 man-hours. HS 25 took 20 hours, 84 minutes, more than twice the time, to produce these machining times of total.

This machining knowledge was one of the goals of the research contract.

PETRO-CHEMICALS
(Continued from Page 9)

which makes blocks a valuable ingredient in rubber for cable manufacture.

Other rubber products in which carbon black is used are: non-conductive belting rubber belts for machinery, rubber hose and rubberized fabrics.

Carbon black is the most finely divided black pigment available for the manufacture of printing inks, paints and plastics, and there is a small but expanding market for rubber products. The finished product is often blacker than the pigment itself, and is also available in a wide range of tints, including green, blue and red. The carbon black pigment is used in the manufacture of end-products.

As with all other industries, the production of carbon black is not only a problem. It is also a problem for the manufacture of end-products. There are other more unexpected applications of carbon black. It is used in the manufacture of cosmetics, nylon and confectionery, as well as in the manufacture of rubber products.

Not all carbon blacks are suitable for all applications. Some grades of carbon black are used in only specific applications, and each grade of black has its special properties in the manufacture of end-products.

Carbon black is also used in dry cell batteries, in the manufacture of duplicating carbon paper and when added to paper pulp it provides the pigment for black paper.

There are other more unexpected applications of carbon black. It is used as a pigment in the manufacture of cement, nylon and confectionery, as well as in the manufacture of rubber products.

Australia still has to import large quantities of carbon black. However, the production of large quantities of carbon black is only now beginning to satisfy the demand of the country, with the result that the production of carbon black is now expanding rapidly.

Domestic production of such a large proportion of the nation's requirements of carbon black, even though it is now only a small proportion of the total, is a significant step forward in the production of carbon black.

(From "Petroleum Gazette")
When I undertook to write a couple of articles about modern automatic lifts I really didn't know what I was letting myself in for. The more information I gathered the more I found that the modern lift is not only a marvel of mechanical and electrical engineering but one of the most ingenious devices ever to have been thought up by man.

By Calvin Walters

It would be impossible in two articles to adequately cover all the features in detail and, as the Editor has said, "Walters, two articles only." I will have to cut the cursive and get straight on with the business.

Fundamentally a modern lift consists of ropes passing over a pulley wheel fastened to the shaft of an electric motor. One end of the rope is fastened to a car for passengers or goods. The other end is fastened to a weight or counterweight. This balancing effect reduces the power of the motor required to drive the lift.

The friction of the ropes on the arc of the pulley (called the "arc of contact") is all that drives the rope over the pulley when it turns, thus raising or lowering the lift.

To get a clear picture of the entire installation we will deal briefly with each section, beginning with the car.

This is, in two sections, called respectively the "sling" and the "car." The sling is a frame made from steel sections bolted and welded together so that it forms a rigid support for the car. The sling is at the bottom of the lift well the weight of the lifting ropes is added to the weight of the car. On the other hand, when the car is at the top, the weight of the ropes is added to the weight of the counterweight.

The car consists of a steel "room" securely fixed inside the sling. In modern lifts the car is insulated from the frame of the building in various ways so that vibration from motors and ropes will not be transmitted to the body of the car.

The floor area required for a lift is arrived at by a simple formula. Generally speaking a floor area of 2 square feet per person is the average for contract loads of up to 10 people. For increasing loads, beyond about 1,500 pounds, the floor area decreases so that for loads of 20 people only 33 square feet is required and 46 square feet for 30 persons.

The contract load and the contract speed are the maximum values specified in the purchase contract.

The "counterweight" usually consists of cast iron sections securely bolted together by means of rods passing through each end. The weights are mounted in a frame with a top and bottom cross member to which are fastened guides on each side.

COUNTERWEIGHT SYSTEM

To the top cross member is fastened the ends of the hoisting ropes running from the car. The weight of the counterweight is the weight of the car plus 40 per cent of the load. Ropes used in lift hoisting must, of necessity, be of the highest quality and combine great strength with flexibility. It consists of stranded wire laid round a central core which is impregnated with a special lubricant for continuous lubrication of each wire in the strand during use.

A rope may consist of six or eight strands, each strand consisting of up to 19 wires. Ropes can be up to 33 inches in circumference with a breaking strain of up to 720 tons per inch.

The minimum number of ropes used is three, whilst the maximum for modern lifts in high buildings is eight. It will then be appreciated that there is a wide margin of safety.

There have been many kinds of motors used on lifts over the years, "but these have been reduced to three main types.

For car speeds of up to 150 feet per minute the usual motor is a three-phase A.C. motor, driven from the mains, is mechanically coupled to a reduction gear where high-speed operation is envisaged. For this reason A.C. is still the preferred form of power for lifts and other traction systems (trains, trams, etc.).

Even where A.C. is the only power available, the advantages of D.C. motors are sufficient to justify converting A.C. to D.C. by some form of inverter or rectifier. The chief advantages to do this. The one most commonly used for lift systems is the converter drive, where an A.C. motor, driven from the mains, is mechanically coupled to a DC motor. The second most used is then driven to use the lift motor.

For low-speed systems, i.e., 200 to 350 feet per minute, it is usual to employ a reduction gear, even with D.C. motors, since this permits the use of a given size motor. Speeds in excess of 300 feet per minute are seldom
practical in small-G. (3") buildings, since it is not pos-
ible to use "express" services where there are only a few
floors to service.

For speeds of 500 feet per minute and up—which is
getting into the "fast" category—direct drive DC motors
are invariably used, again red from a suitable motor-generator
set. These motors will run at speeds up to 160 revs. per
minute.

A further advantage of the motor-generator system of
AC/DC power is that its method of speed and direction control
is always a problem with heavy duty electric motors, but the
amounts of current which must be handled when the control
system is considered directly in the motor circuit.

TYPICAL CONTROL SYSTEM

A typical control system is the Ward Leonard method,
as used by the Otis Elevator Co. Simply stated, this system
speed and direction of the lift motor by varying the
strength and polarity of the current supplied to the
field, and by reversing its polarity, it is possible to vary both
the voltage and polarity of the generator, and thus control
the speed and direction of rotation. Because only relatively
small values of current are involved it is an ideal system
of control.

The shaft of the driving motor is extended a foot or two
beyond the extremity of the case. This extension pro-
vides the driving sheave, consisting of a grooved plate
over which pass the driving ropes.

This system of drive is called "traction drive," as dis-
volved from the old and now obsolete "drum drive." The
traction drive is the simplest, cheapest, and safest method.
It is the friction between the rope and the grooves on the
sheave which supplies the traction to lift the car. Thus
if the car or counterweight comes into contact with the
sheave, slipping occurs and all drive ceases. There
is no likelihood that the lift will be wound into the roof!
As the drum revolves, one set of ropes is wrapped
around the drum in a clockwise direction while the other
is wrapped anti-clockwise, so that when one set is wrapping
the other unrolls. Thus the ropes move along the
drum in spiral fashion. This system is especially suitable
above about 100 feet, and also suffers from the disadvantage
mentioned previously.

Between the sheave and the end of the motor case is
located a brake drum. This acts in a manner similar to
a clutch, and is used to stop the motor, or bring the
motor to rest in any given position.

There is also an insulated strip B. This is one of the many
safety devices which are part

Radio, Television & Hobbies, March, 1962

items discussed in detail. (Otis Elevator Co.)
Basic circuit from which the automatic lift system is derived. Once a cell is initiated the associated contacts are held in until the car reaches that floor. However, more than one cell at a time could cause complications, and additional protective circuits are needed.

Strip A is connected through a "downward direction coil switch" D to the negative wire, and Strip C is connected through an upward direction coil switch U to the negative wire.

In the diagram the lift is standing at the third floor. All switches are open and the floor brush for the third floor is standing on the insulated strip B.

Assuming that button 4 is pressed on the fourth floor, the following is the sequence of events:

Contact 4 allows current to flow through coil 4F, which is energised and closes contacts 4F. Since these are in parallel and contacts 4, the latter may now be released and contacts 4F will take over. The system is then "self holding."

To complete the circuit, current will flow through the floor brush, through strip C and the "Up Direction Switch" to the negative side of the line. This energises the up direction switch which switches on the motor to move the lift upwards.

As the lift moves upwards the strips A, B, and C also move in a direction corresponding to the upward movement. When the insulated strip B contacts the floor brush for the fourth floor the circuit is broken and the lift comes to rest.

One of the safety devices fitted to the modern lift; the governor. Immediately a certain set speed is exceeded the governor applies the safety clamps on the underside of the car at every floor where a button has been pressed, levels the car at the landing, opens the doors, controls the signals and indicators, and so on. Most of these functions are carried out by mechanisms released by the selector and which operate magnet-operated switches and other devices in the control-circuit, and cause a progressive slowing down of the lift. Where the selector operates the levelling device which causes a floor bar contact which, via the controller, switches off the motor and the motor then switches off.

The selector

A picture of a selector is given herewith, and we will describe briefly its main sections. Firstly there is a toothed wheel. This rotates quite rapidly. They would make great revolutions between one floor and the next but, because the sensing rollers move with the crosshead, any one can only operate when the car is approaching the correct floor.

In some modern lifts there is a load weighing device. One of the main purposes of this is a system of rollers under the floor. These compress with the weight of the load so that, if the load exceeds 80 per cent of the rating, micro switches operate to prevent landing buttons from operating.

Also connected to the main drive mechanism is a shaft which is energised in the same manner.

Four of the secrets of this accuracy is the fact that the levelling cams rotate quite rapidly. They would make great revolutions between one floor and the next but, because the sensing rollers move with the crosshead, any one can only operate when the car is approaching the correct floor.

One of the safety devices fitted to the modern lift; the governor. Immediately a certain set speed is exceeded the governor applies the safety clamps on the underside of the car, and if necessary, applies the safety clamps on the underside of the car. (Otis Elevator Co.)

(Continued on Page 111.)

Radio, Teleradios & Hobbies, March, 1962
Wharfedale have done it again with the following two outstanding new models:

**RS/12/DD and Super 10/RS/DD**

**BRIEF SPECIFICATIONS:**

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<th>Voice Coil Diameter</th>
<th>Max. Input</th>
<th>Frequency Range</th>
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<tr>
<td>RS/12/DD</td>
<td>14,000 gauss</td>
<td>1 1/2 in.</td>
<td>15 Watts RMS or 30 Watts peak</td>
<td>25-15,000 cps.</td>
</tr>
<tr>
<td>Super 10/RS/DD</td>
<td>16,000 gauss</td>
<td>1 in.</td>
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1. New Roll Surround (RS), permitting large cone movement without non-linearity, thus giving clearest possible bass.
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Radio, Television & Hobbies, March, 1962
Now that Project Oscar is an accomplished fact and plans are well under way towards putting Oscar II into orbit it is interesting to read, in this article recently to hand from the U.K., a summing up of the work which went into the orbiting of the satellite and some of the results and observations from the U.K. point of view.

PROJECT Oscar — Orbit Satellite

Carrying Amateur Radio — was sponsored by the A.R.R.L. as a means of promoting radio amateur activity through the medium of the Agena aerial system was invaluable when at-operating on 72.5 Mc/s supplying drive continuous reception became possible, and at the satellite to which it had been attached tempting reception at great distances, a series of tests from Vandenberg Air Force, California, to 2106 G.M.T. on December 13.

Two hours later the Oscar vehicle separated as planned from the Agena satellite in which it had been attached and started on its own 91.7 minute polar orbit some 250 miles above the earth. Measuring 12m by 10m by 8m, the package contained a transistor crystal oscillator and amplifier operating on 72.5 Mc/s supplying drive to a VHF dipole doublet sum output stage radiating from a 19-inch monopole attached to the casing. The VHF transmission consisted of the Morse letters "HI" keyed at a modulation rate of 20 bits per second which were transmitted as a carrier frequency of 145 Mc/s.

The first record of reception in Britain came from Arrow McIndoe, G30SS, of Finchley, London, who heard a very strong signal at 0055 G.M.T. on December 13, the carrier frequency as the satellite approached and then receded from his station in an almost overhead pass. The frequency shift was measured by L. V. Dent, G3GDR, Abbots Langley, as some 7 kHz.

The B.B.C. Frequency Measuring Station at Hatfield, Herts, measured the frequency at 144.984 Mc/s and found that within the permit of the U.S. Air Force, receivers that signals could be heard under favourable circumstances for a period of about ten minutes, during which time the satellite had travelled approximately 2,900 miles.

Mr William Brown, G3AOX, of Hendon, made an all 47 separate observations on the signal strength and supplied details to the D.J.R.K. Radio Research Station, Slough, who, in turn made available predictions of when the satellite should be within range of the British Isles, together with its course and estimated height. These predictions proved extremely useful and with subsequent corrections, remarkably accurate.

A number of observers measured the time of nearest approach (T.N.A.) by ascertaining the time at the centre of the Doppler frequency shift curve. A favoured method was to record on tape the received signal beating with a fixed frequency together with time markers, the tape being evaluated after the event.

Signal strength naturally varied according to the distance of the satellite from the observer, examples being 4 db above line when it was 1,000 miles east of London to more than 30 db above noise on an overhead pass.

The majority of amateurs operating on the two metre band were using beam aerials with horizontal polarisation not the best arrangement for obtaining accurate bearings. However, accurate extremes of direction in azimuth were not a prime requirement and the possession of a high gain aerial system was probably when attempting reception at great distances.

No unexpectedly long range reception has been reported in the United Kingdom but one instance occurred when a short burst of signal was heard, probably by means of scatter, shortly before continuous reception became possible. Considerable interest was shown, in the project by the amateurs in the United Kingdom and the majority of reports were of high quality. A preliminary assessment by the organised amateurs mentioned more than 2,500 separate tracking reports received from all over the world and from amateurs in the United States.

The B.B.C. project has now been announced that Oscar II will be launched in the most probable first half of 1963, carrying a 0.1 watt transmitter which will be of sufficient power to work in any direction to manned satellites. The majority of reports came from Angus McKenzie, G30SS, of Tatsfield, with indications of many more to come.

With the co-operation of the U.S. Air Force, Oscar II is intended to have a life capacity for that purpose. Toward the end of Oscar II, however, it became obvious that all was not well with the receiver, and experiments indicated that it "hit-rate" indicated a high temperature in the receiver and that the whole system failed, causing a somewhat unsatisfactory demonstration.

A signal strength thereafter decreased rapidly due to the constant drain on the battery, and the electronic components were exposed to a high pressure on other transmitter components and the last word was heard on January 3. (From "Electronics Weekly")

BRITISH OBSERVATIONS OF "OSCAR" SATELLITE

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Radio, Television & Hobbies, March, 1962
COLOR ANALYSER GIVES FILM PRINTING DATA

This article describes an ingenious method of achieving uniformly high quality colour positives from 35mm motion picture colour negatives. We present only the salient features, since the original article is quite long and involved, but we feel that these will be of general interest. The complete article appeared in "Electronics" dated January 1, 1961.

COMMERCIAL 35 mm colour motion pictures are produced by a negative-positive process. The input of a 35 mm colour motion picture camera is a colour negative, from which any number of positive prints can be made. In this negative-positive process both colour balance and density of the positive are controlled by choice of light and intensity to print negatives. Therefore, the printing light colour and intensity must be reviewed for each scene in the film.

Some methods involve trial and error processes in which test prints are made; then, based on the results of several trials, a final selection of conditions is made for each scene. This cut and try method is both time-consuming and costly. The colour film analyser provides an alternative method that enables the operator to see instantaneously the results for any given printing light, and select the printing conditions.

The colour film analyser consists of a flying-spot scanner that scans the colour negative and enables subsequent density to see the negative substantially as it is seen by the positive film stock. The taking sensitivities, chemical processing and cross-coupling in the image printer, employs a white light, and conditions are selected amounts of three narrow-band dyes. In this analyser the image that is produced by the scanner-luma density signals are so processed to simulate the excessive low-frequency response properties of a line-tube equivalent to a certain electronic phosphor, such as a colour printer.

Next in the chain is a stepped attenuator that simulates variations in intensity of the exposing light in each channel. This attenuator is controlled from the computer panel, and is used by the operator to produce the final picture. The three stepped attenuators are calibrated in terms that can be used directly in additive-motion picture printing machines.

Total exposing light is composed of three narrow-band red, green and blue primary lights. An alternative type, known as a subtractive printer, employs a white light, and combinations of colour correcting and neutral density filters.

In producing data for a subtractive printer, a computer derives its input from the subtractive steps mentioned associated with the printing intensity controls. This is presented on meters calibrated in terms of filter density.

The next block is a limiter that prevents signal excursions in the blatter-three-black direction from overloading the following D-version amplifier. This stage is a non-linear amplifier that simulates the nearly logarithmic relationship between exposure E of a film layer, and the density D developed in the layer.

ELECTRICAL REPRESENTATION

The electrical values in each channel represent dye densities and are logarithmic terms. Some methods involve trial and error cross-coupling or masking can be performed by linear circuits, and some results can be changed by linear changes in gain. The density signals are then processed to simulate the characteristics of the print film, including the unwanted absorptions of the three dye layers. Finally, these signals are delivered through three exponential amplifiers, which with the square-law characteristics of beam current versus grid voltage of the picture tube, produces the correct colours on the face of the tube.

Since the Colour Film Analyser is used in processing laboratories, it must provide, accurate information and exhibit a high degree of stability. Several features have been incorporated in the basic design to insure the stability; these include feedback techniques, stabilized keying schemes, careful choice of critical components, and precise calibration procedures.

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<tr>
<td>Proven “bullford”</td>
<td></td>
<td>£35/-/-</td>
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<tr>
<td>Stainless No. 2, 7 watt</td>
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<tr>
<td>“Instrol” Program Source No. 1</td>
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<tr>
<td>“Lederart” 573V Stereo with Sapphires</td>
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<tr>
<td>“Lederart” 572V Stereo with Diamond for Stereo and Standard Sapphires</td>
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<tr>
<td>“Lederart” 605 with “All Balance” Arm</td>
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<td>£35/19/3</td>
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<tr>
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<th>Price</th>
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<tr>
<td>“B and O” Pick-up type STM with head and diamond stylus (for use with “Lederart” 605 turntable)</td>
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<tr>
<td>“B and O” Cartridge with diamond stylus for use with “All Balance” arm.</td>
<td></td>
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Radio, Television & Hobbies, March, 1962
DESIGNS USED IN FLAT DYNAMIC SPEAKERS

One of the advantages claimed for the electrostatic speaker is that the actuating force is applied equally over the whole of the diaphragm area, thus eliminating many of the standing wave problems encountered in conventional voice coil/cone assemblies. Recently, novel voice coil designs have enabled this advantage to be acquired by the magnetic types, a step which could result in a completely new approach to loudspeaker design.

One of the surprises of the Parts Show in Paris last year was an electrostatic flat dynamic speaker. Based on a novel concept, the speaker acts as a flat or "zig-zag" design and attached to an extended light but rigid sheet of polystyrene foam. The polyester sheet is shaped so as to fit the edges of the ribbons and the entire sheet vibrates, and the amplitude of the oscillations can reach nearly 2 mils. The sheet is called the Orthophase and its performance was remarkable.

The diaphragm consists of a grid made of aluminum wire cemented to a thin diaphragm of treated paper. Magnetostriction in the grid, as seen in Fig. 2, is used to excite eddy currents in the moving coil. This, however, uses the flat voice coil to excite eddy currents in a moveable diaphragm, apparently the first use of the principle in the reproduction of sound.

The Orthophase speaker voice coil system, Fig. 3, is the result of a flat magnetic field over practically the entire sheet of moving material. Emson engineers point out that the principle can be as important in the microphone field as in that of speakers, and that considerable work is being done on flat-coil microphones.

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Now that new television stations are starting to go into operation in country areas, many servicemen face a large outlay in providing sweep generators, oscilloscopes, and vacuum tube voltmeters.

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Photoelectric cells are mounted on each side of the tank turret to receive a light beam approximately 25 feet wide. A direct hit from the light gun of one tank on the photocell of another automatically triggers a disabling relay that cuts off power to the tank drive motors. This permits the tanks to be killed or be disabled.

When a tank is disabled by gunfire, a red indicator lamp located on the rear apron of the tank comes on. A manual override switch can be operated to restore the tank to action. The turret receives its power through an etched circuit strip. The internal components are packaged in plastic and are interconnected by cables and plugs.

Fifteen radio-controlled models are used on a 76 by 29 foot terrain board containing various types of natural and man-made features scaled in ratio to the model tanks.

REALISTIC MANOEUVRES

When the battlefield is in operation, tank crew members sitting on a steel platform that can be moved over the terrain board, control the model tanks to carry out tactical movements.

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Although evaluation of the training effectiveness of the miniature battlefield is still underway, preliminary results indicate that soldiers trained indoors with the scale model radio-controlled tanks fight real tanks under actual field conditions better than soldiers who were not so trained.

The development of the radio-controlled models constitutes a break-through in realistic combat training and work in this field is proceeding with the constant purpose of improving the conditions of field operations and the savings of large numbers of tax dollars.

(From "Electronics")
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Radio, Television & Hobbies, March, 1962
DIE BEARINGS

BEARINGS made of dry lubricants can synergize with high-temperature reinforcing fibres to be used in motors to solve lubrication problems in live locations.

A recent report said they weigh only 1/3 lb. as much as metal bearings, and less, as are self-lubricating. They are trouble between 300 degrees below zero Fahrenheit and up to 1,000 degrees Fahrenheit.

The first experimental bearing was a mixture of molybdenum disulphide and sodium silicate, reinforced with asbestos fibers. Now other glass and metal reinforcing material is being tested.

SUMMARY CONCLUSION

UNUSUAL CERAMICS

CERAMIC materials which will resist high temperatures but which will also conduct electricity are now being made by a Netherlands concern. This unusual combination is achieved by applying a layer of powdered silver or platinum to the edges of a small section of the ceramic and then joining two more sections together under the action of heat and pressure. The seals are stated to be quite secure.

In Eindhoven, Holland, a company permits exact duplication of a factory, or, since the colors are made in a shop and have it matched at the West Germany for micrographic work in research and other scientific applications.

COLOR MATCHING

A COLOR communication device developed by an American paint company permits exact duplication of a color to be transmitted and reproduced.

The device looks rather like a table model television receiver. The color is shown on a circular glass just under the action of heat and pressure. The seah is stated to be quite secure.

A customer can select a color in a shop and have it matched at the factory, or, since the colors are made in small batches, a permanent record of a color can be kept by noting the setting.

A FULLY automatic 35-mm. camera has been developed by Leitz of West Germany for micrographic work in research and other scientific applications.

AUTOMATIC CAMERA

A POLY automatic 35-mm camera has been developed by Valspar Corporation, Wilmington 98, Delaware, U.S.A.

INK has been eliminated in a newly devised ball-point pen and replaced by ultrasonic vibrations. The pen contains a tiny diaphragm which produces high-frequency oscillations which cause the ball-point to vibrate very rapidly.

This vibration modifies the patterns of the fibers in the paper over which the pen passes and leaves a visible and indelible trace. If the paper contains a dry film, it tends to concentrate along the line formed by the ball.

Characters written with the new type of pen are said to be impervious to heat, moisture and light. Applications suggested include recording chart installa-

SAFETY CLOTHING

PLUOCARBON Textiles to be transmitted.

In the case of films exposed to harsh fires or extremely corrosive chemicals.

The safety materials, originally used for promotion of men handling high-temperature coils, has now been made available for general works safety purposes. Where flash fires are a problem, the aluminum foil can be used to cover the electrical equipment.

A UNUSUAL CERAMICS

PROTOTYPE SOLAR CONCENTRATOR

The safety material, originally used for promotion of men handling high-temperature coils, has now been made available for general works safety purposes. Where flash fires are a problem, the aluminum foil can be used to cover the electrical equipment.

BURNING WET COAL

A UNUSUAL CERAMICS

FLUOROCARBON textiles faced with a metallic foil can be omitted.

COLOUR MATCHING

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The camera shown above uses a type 7038 Vidicon tube. This tube is available as a direct replacement for Shibaden closed circuit TV cameras, or for use in existing TV cameras at only PRICE £98 PLUS TAX

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ELECTRO DYNAMICS LTD.

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Radio, Television & Hobbies, March, 1962
But, it is normally used in the manufacture of semi-conductors. Similar to copper, it is also used in electric circuits and for making electronic components.

In the Netherlands, a company has recently been awarded a patent for a new method of producing fibre optics. This method involves the formation of fibre bundles, which are then coated with a thin layer of plastic. The resulting fibre bundles can be used to transmit light over long distances, making them ideal for use in telecommunications and other applications.

Another recent development in fibre optics is the use of fibre optic cables to transmit video signals. These cables are made from a special material that is highly resistant to electromagnetic interference, making them ideal for use in broadcast and telecommunications applications.

However, the use of fibre optics is not limited to long-distance transmission. They are also used in many other applications, such as medical imaging and sensing. For example, fibre optic sensors can be used to measure temperature, pressure, and other physical parameters in real-time.

Fibre optics are also used in the construction of microfabricated devices. These devices are made with a high degree of precision and are used in a wide range of applications, such as micro-electromechanical systems (MEMS) and microfluidic devices.

In conclusion, fibre optics are a versatile and powerful technology that has revolutionized the way we transmit and process information. As technology continues to advance, we can expect to see even more innovative applications of this exciting field.

**References:**

This fourth article in the series deals first with the Pedal Clavier, then carries the project to the point where the organ is completed in its initial form.

WHERE this article takes up, the constructor should have completed the tone generator, the control panel, the amplifier and supply unit and the expression pedal. The keyboard should be on hand and cabling ready for interconnection.

As matters have worked out, the constructor may already have interconnected the units and had them working, while spread over the kitchen table. Or should we say working—a fashion!

As we were careful to emphasise earlier, the organ depends heavily on provision and proper use of the pedal clavier, to fill in the bass end of the chords. This remark applies equally to any small electronic organ, having a shortened keyboard and limited scope for the left hand.

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Accordingly, the pedal clavier is one major unit which should be on hand and cabling ready for interconnection. For these varied reasons, we were careful to emphasise earlier, the organ depends heavily on provision and proper use of the pedal clavier, to fill in the bass end of the chords. This remark applies equally to any small electronic organ, having a shortened keyboard and limited scope for the left hand.

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inches, while the "black" notes are about 44 inches long.

As shown in the photograph, the pedals are covered with an adhesive layer of white or black plastic, which can remain in position, if desired, or be stripped off to reveal the wooden surface underneath.

So much for the Pedal C. With this unit on hand, and the loudspeaker the next big job is to assemble the whole into the console. The idea will doubtless occur to many of building their own console. There is absolutely no objection to this, if you can handle the job, and it will not prejudice the availability of the rest of you can work out details to suit yourself.

THE CONSOLE

As indicated by the advertisements, a console is available as part of the kit in either polished or unpainted form. It must be left to individual constructors to decide whether or not they can handle the staining and polishing themselves.

If you are adept at this sort of thing, by all means do it yourself. If there is a doubt, it would seem well worthwhile to pay the extra and get the fully polished version. With so much tied up in the cost, it is well worth the additional outlay to have the job done properly.

Because of the pressure on space, we do not propose here to launch into a detailed discussion of staining and polishing methods. Our best advice, if you decide to do it yourself, is to check and double check all your methods before you start. Then, before you touch the console, try the method on some pieces of comparable plywood, preferably knocked together to form a corner or two, as well as the plane surfaces.

In all these. In overall dimensions, the console is absolutely no objection to this, if you decide to extrude into the underside of the legs. As a first step to fitting up the console, we would suggest providing for a facility that is not included in the original design — an extra loudspeaker to carry reverberated sound. Whatever your ideas on this subject at present, the question is certain to arise later and the best time to plan is before the console is filled up with major components.

Reverberation can be arranged in various ways but for the method we have adopted involves the use of a small supple- menary amplifier and an extra loudspeaker. This latter could conceivably be housed in an entirely separate small box, it could be fixed to a small baffle point- ing out the back of the console, or suspended in some other way. The console is filled up with major components.

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- HOW TO GET THE BEST OUT OF YOUR TAPE RECORDER. A comprehensive guide to recording excellence. Price 10.1. RADIO CONTROL OF MODELS
- MODEL RADIOMATIC CONTROL. (Gernsback) Price 30.5. This book is the only one of its kind and the one logical position for the extra speaker, did proved practical, however crazy it had seemed. We had reached this decision, what we did proved practical, however crazy it may sound.

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THE KEYBOARD

Next job is to fit the keyboard. This may be easiest if you have already removed it, or the printed-circuit contacts may be needed in place to provide a base for the tone generator, as already described.

Lifting out the tone control panel faces will allow the keyboard to be lowered into position. Ideally, it should just fit into place and be held by eight machine screws, each with a 1/8in dia. discwasher under the head. In practice, it may be necessary to jiggle things slightly.

If the holes matched up with the wooden side cheeks much better if the assembly was raised back at the strip with a strip of floor felt. However, too much packing caused the back of the notes to foul the control panel. Cutting the hole below their nominal "up" position. Normally, it rests on two Verbration system have yet to be given but we are suggesting that you allow

It is necessary also, as position the unit carefully to prevent the end notes from bending it should fracture the copper contact wires on the board. But do NOT bend or roll them. Keep them flat and their self-adhesive backing out binding. See that the control panel — or at least there

The cables are secured to the woodwork to keep them firm and away horn the polished cabinet and the plastic key-

A rear view showing how the components mount inside the organ console.

Wiring details of the jack and switch beneath the left hand end of the console. The treble headphones are aesthetically rather unattractive but it helps prevent individuals to estimate volume.

The cables are secured to the woodwork to keep them firm and away horn the polished cabinet and the plastic keys. It was necessary to position the \( \text{REVERB.} \) amplifier on the rear of the keys slip between the gold \( \text{CONTACTS} \) and the chassis to be laid horizontally, wiring upwards, on two other cleats. With the keyboard in place, the tone generator chassis can be slipped into position. Normally, it rests on two vertical cleats, with crowd-headed wood screws, through which each of four slotted holes, but not tight,

Getting the printed boards back into position behind the keys can be a some-

With the amplifier fitted, the chassis may be wise to delay adding the arrow-

Wiring details of the jack and switch beneath the left hand end of the console. The treble headphones are aesthetically rather unattractive but it helps prevent indi-

holes. In one case we drilled new holes in the other, we used slightly longer screws and a couple of spacers. Before you put every last screw in, however, make sure that the control panel is centrally central in the holes through the face. If not, enough connections fit to allow the long knob shanks to pass through with- out bending.

Fit the knobs when all is well, but it may be wise to allow the arrow-

head indicator labels until operation of the organ has been checked. Later on, when this has been done, the knobs can be turned to the normal "off" settings and the 'heads simply locked on in this position, and the labels on the backs of the "off" labels onto real keys when you are ready to use them and do not bend or roll them. Keep them flat and the fabrication backing will hold them firmly therewith.

FITTING THE AMPLIFIER

Attention can now be turned to the case and underside of the console. The floor of the console is studded in take four screws passed up beneath bushed and locked in position by nuts brought down right and recessed flush with the sur-

Front and rear views of the amplifier with labels on the terminals with the holes in the amplifier chassis.

Several holes in the floor of the cabinet receive threaded bushes with
There is a planned AWA Sound Reproduction System for every need in the commercial, industrial, educational, cultural and entertainment activities in the community. The range of AWA Audio Amplifiers, Microphones and Speakers provide a type for every purpose, with features and facilities to meet every need in sound amplifying and distribution.

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Radio, Television & Hobbies, March, 1962
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i lowers the oscillator frequency,
of circuit. before tackling the present organ. After shift in the desired direction.

After the third run through, the in- The range of the potentiometers is

mentary diagram.

switch arranged to open one of the latter

it.

The expression pedal should drop

brand new pieces, which won't come right through!

With the expression pedal in the jack and the speaker cut out son.

The pedals do

surrounding area, and to have the Expression

Middle C

A

E

F

G sharp

A sharp

D sharp

G

C above middle C

5 beats flat in 5 sees.

D sharp

G sharp

A sharp

D

F sharp

C sharp

A

C above middle C

normal practice is to run the twin

contact to open one of the two soc-

D below middle C

G flat

A flat

C

PROCEDURE FOR SETTING TEMPERAMENT

PLAY

PLAY AND ADJUST

TUNE

Fork 523.7 c.p.s.

C above middle C

Middle C

To exact pitch

5 beats flat in 5 sees.

D

B

A

G

E

F

A flat

C above middle C

Middle C

To exact beat

5 beats flat in 5 sees.

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If a core setting cannot be found just for the heck of it. for the core, don't wind it in and out of possible "ageing" worries by thought-
that the first tuning should be regarded by the way, the note we have referred i
ful treatment of the adjustments. Having 0
better still, several days later, will bring t
C206 and C207. so,
cember issue, those involved are C201, tur
pot. has to be turned too close to either til
but try to avoid the situation where the int
ductor core to bring the note, if pos-

without vibrato, and adjust the in-
er C-sharp, set the organ to Diapason y
into same, this can be used as a tuning p

If the organ is within earshot of an-
other organ or piano, or can be brought to

If you try to turn it. Use a small screw-
driver which fits the slot in the head ii
S

than exact concert pitch is a
lot better than one which is not tuned
at all. Why not standardize on one of these components, a

The pitch, using their respective potentio-
A new product of FERRIS INDUSTRIES LTD., BROOKVALE, N.S.W.

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TOWNSVILLE, Q'ld.
As a further possibility, though a vague one, is that you may be able to borrow an old standard tuning fork for a particular octave. If you can, your problems will virtually be over, since they all guarantee precise pitch, as well as precise pitch.

But, last not least, there is the classic approach of "setting a temperament", which is described below. If you have already some experience with procedure, private "secret" things, and so on.

Setting a temperament is based on the fact that when the lower order harmonics of two different notes nearly coincide, they produce audible beats, and this establishes the relationship of the two notes concerned. To do this, you will need various tools. A modern keyboard instrument involves a number of separate voltages distributed over the entire octave, such that the instrument can be played in any key without excessive dissonance between the notes.

"Setting a temperament" therefore involves tuning pairs of notes in a prescribed sequence to produce a pre-determined waveform, some may have difficulty in hearing the beats. Need it be said that a perfect pitch is not achieved, but must instead be checked.

The complete procedure takes in each note of the octave in turn to check in terms of overall accuracy. Having set one octave, all other octaves can be tuned to it by the procedure outlined.

SETTING AND VOLUME

As before, setting a temperament is best done during the daytime. Choose a quiet room, and listen to a volume which experience shows to be the greatest pitch which you can most clearly hear the beats. Need it be said that a silent room is something to be sought, but how worth arranging for all concerned?

The first step is to set the pitch of the notes A above middle C. This could be taken from some instrument, from the record referred to earlier, or from a 523 cps tuning fork, which can be obtained from music stores for a few shillings. Place the fork on a raised surface against the centre octave, the others can be set to agree. Having set the temperament of the centre octave, the others can be set to agree. Having set the temperament of the centre octave, the others can be set to agree.

The pedal clavier has to be tuned to the keyboard, using the lowest octave for reference.
A range of high quality audio equipment to the original "R.T.V. & H." designs. Australian designed, Australian made, guaranteed and lifetime serviced. Available ready built and tested, or in kit form ready to build yourself. At a price well below that of similar imported amplifiers. Happy owners of Instrol Playmaster come from all walks of life.

SUGGESTION 1 (kit project to build yourself):
Amplifier — Instrol Playmaster Unit No. 3 Kit of Parts.
Player — Dual 1007 Player.
Loudspeakers — 2 Magnavox 8WR Twin Cone.
Enclosures — 2 Instrol 8ln Kits.
Cabinet — Instrol Equipment Cabinet.

Total Cost £97 9 5

The Unit Playmaster Nos. 2 and 3 are virtually identical in appearance. The Unit No. 3 is rated at 7 watts total R.M.S. (equivalent to 14 watts American) and the Unit No. 2 is 14 watts total R.M.S. (equivalent to 28 watts American).

PRICES:
Unit Playmaster No. 3 Kit of Parts £31 10 0
Built and Tested £39 18 0

Unit Playmaster No. 2 Kit of Parts £39 14 0
Built and Tested £49 18 0

The above, with amplifier built and tested, and with fully polished speaker enclosures;— a good quality Stereo outfit complete with its own equipment cabinet; £118/15/5.

SUGGESTION 2 (kit project to build yourself):
Amplifier — Instrol Unit Playmaster No. 2 Kit of Parts,
Player — Dual 1006A (Auto).
Loudspeakers — 2 Goodmans Axiette II.
Enclosures — 2 Instrol 8in Kits.
Cabinet — Instrol Equipment Cabinet.

Total Cost £136 6 6

SUGGESTION 3:
This is a very high quality outfit, carefully thought out for he who must have the best. It includes ready built amplifier and tuner, fully polished speaker enclosures, but does not include an equipment cabinet. We will gladly quote you for the construction of a high quality of equipment cabinet to suit your own ideas of design.
Amplifier — Instrol Unit Twin 10 Watt.
Tuner — Instrol Playmaster Program Source No. 2.
Player — Thorens Transcription TD124
Loudspeakers — 2 Wharfdale 12 RSDD.
Enclosures — 2 Instrol 12in.

Total Cost £326 6 3

We carry comprehensive stocks of speakers, players, etc., and will gladly advise and quote you for combinations of your choice. Send coupon, call or write for details of the complete range of Instrol Playmaster Hi-Fi equipment.
No matter where your interest lies, particularly if it is a circuit by "R. TV & H." Broadway Electronics can supply the parts. We will gladly quote for whatever materials you require.

A.K.G. STEREO HEADPHONES
Offer you something completely out of this world for sheer realism and purity of sound. Feather light (only 4oz) they may be worn comfortably for hours. Frequency response 30 to 20,000 c.p.s. with total harmonic distortion less than 1 per cent. Suitable for any type of amplifier. Connection details supplied with phones.

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Full price for the complete kit including cabinet and service manual only £215/1/4 plus 121/2 per cent Sales Tax if applicable.

Yes, if you have in mind remodelling an organ, or building to a special design individual components are available.

(Se t of 16 Chokes £13/7/4 plus 121/2 per cent Sales Tax.)

Call in and see this high quality equipment yourself, or write for full details.

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We have produced a catalogue detailing all Playmaster Hi-Fi equipment. The range extends from a most economical 51-watt mono amplifier, through to the twin 10-watt Stereo Amplifier. A full range of tuners, pre-amps and tape amplifiers, all to "R.T.V. and H." specifications is included. Also available are separate leaflets detailing Instrol cabinet kits, "R.T.V. and H." test equipment kits, A.K.G. headphones and microphones, "R.T.V. and H." TV kits and electronic organ kits. Send now for those which interest you.
I immediately removed the chassis and looked at it, much as the vertical hold became less stable as the set warmed up, finally losing the effect. No. 3 was severe vertical non-linearity and the major ones were markedly associated with the vertical deflection system, but I guessed it was something like the one shown. Anything which upset the bias on the output stage will cause non-linearity and possible foldover. No. 2 was an extension of this, but there was a new foldover, arising from the bias.
valves. However, I finally selected what seemed to be a logical choice based on the valve type, a 12BH7, and a protector-output system, or which was the appropriate circuit board, since there were a few capacitors and resistors. I still had to find and check the coupling circuit between the VTVM leads. Setting a new point where it is finding weak points in the circuit. In fact, the difference was so small that it was hardly noticeable. Nevertheless, it was an excellent chemical cell. Nor was it an experiment, nor was the absence of a transformer of any kind seemed to rule out a block oscillator circuit.

A more realistic explanation suggested itself when I examined the problem closely. While not prepared to stick my neck too far out in such a cursory examination, it seemed a logical place to start. And that, as far as I can remember, is the first time I have made a proposal without knowing exactly what it was for. I was working now. All that remained was to check the heat factor. So I simply had to conduct all my service business on that basis.

My next story concerns a car radio and the rather strange results of "a certain amount of muckin' about" which I had done, and carefully checked for leakage or similar defects. It was an excellent chemical cell. Nor was it an experiment, nor was the presence of a circuit board. I was replacing, or in which I had to rely almost entirely on guesswork. I was lucky that I was not hit by lightning, but I wouldn't like to have to conduct all my service business on that basis.

Unfortunately, my first performance wasn't very impressive. To be sure, it received signals reasonably well, but only against a background of severe hum and an irregular clicking sound. My next story concerns a car radio and the rather strange results of "a certain amount of muckin' about" which I had done, and carefully checked for leakage or similar defects. It was an excellent chemical cell. Nor was it an experiment, nor was the presence of a circuit board. I was replacing, or in which I had to rely almost entirely on guesswork. I was lucky that I was not hit by lightning, but I wouldn't like to have to conduct all my service business on that basis.

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STEREO

HI-FI STEREO AMPLIFIER KIT (S-SS). 8 watts per channel. .19% distortion at 6 watts per channel. Push-pull output, gauged controls, pushbutton selection. Inputs for Baxandall. Mem. Gran. Radio and Tape Record. .£7/12/.-

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FREE CATALOGUE describes the big range of Heathkits for testing. Amateur radio, stereo, auto and marine available on request.
I had half expected the set to be "something of a booby" — possibly a cheet sheet model of doubtful origin and vint-
age—installed in the car mainly as a novelty gimmick. I was agreeably sur-
prised, therefore, to find that it was a modern set, of well-known make, and
otherwise capable of high-class perform-
ance. Unless there was something very
drastically wrong with it there seemed
no reason why it could not be put
into working order for a reasonable
price, and I told the owner this.

However, when I switched it on it
sounded pretty foul. The hum was not
merely frequent, and sounded like a voltage
sided out. With the center tap and one side
of the socket were connected across one
half of the secondary winding, so that
an AC voltage equal to the nominal
secondary voltage (each side of the cen-
ter tap) would be developed, and the other
side of the winding would produce a very
high ripple content. Not much
wonder it hummed.

There was another point of note. When the plug was removed the center
tap was disconnected from chassis and the receiver no longer functioned. How-
ever, AC was available at the two active
pins for use from the mains when required.

As I said, this was all very clever,
and should have worked fine. There
was only one snag; someone, at some
time, had wired the shorting link in
correctly, bridging the wrong active pin to
the earth pin.

The result was an interrupted in-
stead of the center tap being returned

Radio, Television & Hobbies, March, 1961
BY ALAN NUTT

The reason for this falling response may be explained as follows. The signal is recorded on the tape from a constant current source, i.e., the recorded head. A constant current through the recorded head results, in turn, a constant flux which is virtually independent of frequency. On replay, however, the signal voltage induced in the replay head is proportional to the rate of change of flux. As the signal frequency decreases, so the rate of change of flux becomes shallower. Consequently, there is a gradually falling response as the signal frequency was raised but gap losses, leakage inductance and stray capacities all tend to give a fairly rapid roll-off at high frequencies.

This, then, is the reason for the compensation which takes the form of both bass and treble boosters. Treble boosting is effected partly by the 270 pf capacitor shunted across the 470K resistor and partly by the resonant circuit consisting of the 6803 and 3300 pf capacitors, which energises the Play indicator neon, in series across the lOOmH choke, LI.

A 68K resistor is shunted across the amplified circuit to broaden its response and prevent a sharp peak in the response curve at the resonant frequency. A small degree of bass boost is obtained through the network consisting of the 7250 pf capacitor in series with the 6803 and 1300 pf capacitor more effectively in parallel at low frequencies. The result of all this being quite low may then be improved on the other channel.

The pick-up input is applied to the grid of V1 via an isolating resistor which forms part of the resistive mixing system we have employed. This input is in circuit at all times which makes it possible to record a signal which is not an awesome array when broken out by the choke.

The balance control is connected between the two amplifiers. A grid biasing is imposed in both play and record positions of each channel. Consequently, there is a variable bias available from jack J2. This could conveniently be explained as follows: The signal to be recorded is earthed to the stereo position by S2d whereas in the mono position by S2a. The output from V2 is batteries is delivered to the loudspeaker voice coil through the network consisting of the 6800 and 3300 pf capacitors in series across the 470K resistor and partly by the resonant circuit consisting of the 6803 and 3300 pf capacitors, which energises the Play indicator neon, in series across the lOOmH choke, LI.

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651 Forest Rd., Bexley, N.S.W. LW3491-5385

NEW RELEASE! NEW LOW PRICE!
LIGHTWEIGHT
EFFICIENT

TRANSISTOR
D.C.-D.C. CONVERTER

The ideal Power supply for Private or Commercial use—the
P.S. 25 Transistor D.C.-D.C. Power Converter is quiet in
operation, lightweight, efficient and fully laboratory tested. The
Unit comes complete with full instructions, circuit and con-
nection diagrams, and will be available from all A and R
Stockists by Mid-November!

Input Volts 12-14v. D.C.
Output Power 45 Watts maximum.
Input Current 4.45 Amps (13v. in, 45w. out.)
Output Voltage 15v. in—300 & 150v. simultaneously
Output Current 150mA. Continuous (40 watts)
Continuous (40 watts)

Efficiency at full output 79%
Maximum Operating Temp.—150° F. (approx. 65° C.)
Filtering: "HT + High"—50 mV or 0.02 % ripple.
"HT + Low"—requires external filtering.
L.T. and H.T. filtering includes suppression of
harmonics allowing use of converter on sensitive
receivers.

Dimensions: 6in x 4in x 1in approx.
Mounting: 4-hole rear mount. Complete Unit easily re-
movable from mounting bracket.

Factory Rep. A. J. Wytte P./L.
FAA. Homecrafts P./L, (all Tasmanian Branches.)

A. & R. ELECTRONIC EQUIPMENT CO. PTV. LTD. 36 Lexton Road, Box Hill, E.11 Victoria.

Radio, Television & Hobbies, March, 1963
The control grids of V1 and V5 simultaneously. This method utilises what would otherwise be an idle channel and conservatively. This method fully utilises what head alterations matters considerably. Looking at the upper channel, the grid cons.

... again at the upper channel, the grid cons.

... able power output. The stereo microphone inputs via SI a, the S'osl.

... small treble peaking capacitor across the X... resistor substituted for balance. A further point of interest concerns the heater winding. Normal practice is to balance both sides of the heater winding to earth, either by means of a centre tap on the winding itself or artificially by means of a tapped resistor. The aim of this is to reduce hum fields in the vicinity of the low-frequency preamplifier stages.

**FREQUENCY COMPENSATION**

No further changes take place until the plate of V4. Here the record signal may indicate that a balanced line is being used. The bass boost and treble peaking network would upset the response for recording can take place.

The bias oscillator is push-pull connected to a 15K resistor from the output from the record compensation V...fitted if desired. A further point of interest concerns the heater winding. Normal practice is to balance both sides of the heater winding to earth, either by means of a centre tap on the winding itself or artificially by means of a tapped resistor. The aim of this is to reduce hum fields in the vicinity of the low-frequency preamplifier stages.

**BASS OSCILLATOR**

The bias oscillator is push-pull connected...a 390 pF capacitor and a...panel diagrams above are for the pre-amplifier, left, and record pre-emphasis network. Note that the panels may be conveniently divided at the dashed line if a mono version of the recorder is contemplated.
Morganite Type E range of Potentiometers can be supplied in two versions, namely SPDT, DPST, SPDT or 2-circuit opposed action and SPST reverse action.

The new Type W rotary snap-action switch is available in five versions, namely SPST, DPST, DPDT or 2-circuit opposed action and SPDT reverse action.

The well-known Type L push-pull switch is available in two versions, namely SPST and DPST.

Full specifications and test results for each of these switches are supplied on request.

FERRODYNAMICS now available in Australia!

5 big features of BRAND 5

- Distortion-free recordings guaranteed by exclusive time-temperature dispersing techniques.
- Brand-Platine Base assures maximum performance regardless of make of recorder, line voltage fluctuations, tube age, head condition.
- High resistance to abrasion, print-through and cupping.
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- Economically priced—much less than leading competitive brands.

Morganite Australia Pty. Limited
A Member of The Morgan Crucible Group
Sydney—67-1371
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America's finest professional quality recording tape at a lower price than you're used to paying.

<table>
<thead>
<tr>
<th>Tape Width</th>
<th>Footage</th>
<th>Reel Size</th>
<th>Price Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>900</td>
<td>3&quot;</td>
<td>12/-</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1,200</td>
<td>5&quot;</td>
<td>15/-</td>
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<tr>
<td>3/4&quot;</td>
<td>2,400</td>
<td>7&quot;</td>
<td>22/-</td>
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<tr>
<td>3/4&quot;</td>
<td>3,600</td>
<td>9&quot;</td>
<td>29/-</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>4,800</td>
<td>11&quot;</td>
<td>36/-</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>6,000</td>
<td>13&quot;</td>
<td>43/-</td>
</tr>
</tbody>
</table>

DESCRIPTION

Acetate Base 1 mil.
Meet every professional, educational and home recording requirement. Low print through. Unsurpassed full range recording quality at minimum cost.

Acetate Base 1/2 mil.
50% more recording playback time. Thinner base and special coating processes are employed. Maximum economy where high strength is not required.

Dupont Mylar Base 1/2 mil.
Highest strength. Unequalled recording characteristics. Immune to temperature and humidity extremes.

Dupont Mylar Base 1 mil.
Superior quality, greatly extended flying time. Exceptional reliability under adverse conditions. Mylar is the most permanent medium yet developed for magnetic recording.

Dupont Mylar Tedylised 1/2 mil.
100% more recording-playback time. Made from original Mylar with twice the strength of standard 1/2 mil.

OBTAINABLE FROM SOLE DISTRIBUTORS:
Green Corporation Ltd.
88 King Street, Sydney. Phone: BL 1989

4B Radio, Television & Hobbies, March, 1963
be possible to obtain pre-punched chassis and panels through the normal channels. It is considered the panels have all been loaded, A, B, C, etc., and the wires are numbered. If your panels do not correspond exactly, then wiring errors are bound to result.

Wiring at the rear of the panels is

Some components are obscured in the photographs so do not be alarmed if it is impossible to make the number of components on the panel diagram tally with the photographs. We can assure you that the panel diagrams are correct,

UNIT CHASSIS

Both the power amplifier and preamplifier chassis are L-shaped and provided with turned-over lips to add rigidity. They are screwed to the vertical support members, which are mounted in turn to the steel top panel. Two brass or steel rods, tapped at either end, are fitted between the vertical panels across the bottom of the whole assembly to prevent rocking.

These rods are 12in long and the front one should be approximately 2in back from the edge of the top panel so that the whole unit may be withdrawn from its case without the rod fouling the speakers, which will normally be mounted along the front of the chassis. The photographs show the rod too large, a large vice and several lengths of heavy gauge angle iron will prove helpful in holding.

Overall panel dimensions are 19iin x 12iin, with a 1iin lip turned down all round. A large cut-out has to be made to accommodate the Collaro deck and a template giving the necessary dimensions is usually included with the deck assembly when purchased. The template should be placed on the steel panel in such a manner that a distance of 3in remains between the edge of the panel and the edge of the deck at each side. A distance of 3in between the front edges of heavy gauge angle iron will prove helpful in folding.

A small L-shaped panel is fitted on the preamplifier chassis as a shield between the preamplifier stages and the bias oscillator. A space of approximately 3iin must be left between the top of the shield and the deck in order to pass cabling through to the oscillator and rear panel.

With the metal work completed, the larger components may be mounted on their respective chassis, prior to attaching the speedometer cables. The speed cables for the QEQ03/12 must be mounted below the rear panel, so that the valve tips may foul the bottom of the case. Actually, the socket is mounted above the chassis as, in this case, the valve is inverted. If it is necessary to remove the socket mounting ring and turn it over, depending on the brand of socket used.

WIRING DIAGRAMS

The power supply wiring may be completed first, as it does not involve the use of sockets, and the necessary wiring between sockets may be placed in position in the bottom chassis. As the next step, we suggest the wiring of the various panels, diagrams of which are shown in the photographs so do not be alarmed if it is impossible to make the number of components on the panel diagram tally with the photographs. We can assure you that the panel diagrams are correct.

In both chassis, the top panel is given to the right hand, the rear panel is the left hand, and the smaller component panels are placed in the center. A bias oscillator coil. (Telecomponents type 8001), 1500uA level meter, 6 power transformers, 110V at 2.6kV, 2 EF86, 2 NE2 neon lamps and bezels, 2 100mH chokes, 3 pin chassis mtg. socket.

The appropriate number of lugs required on each panel is indicated and the required length should be carefully cut off from any piece, using a fine hack saw blade. Lay the components along the strip, taking care to follow the diagrams as accurately as possible.

The reason for this will be obvious when the wiring diagram, to be given later, is considered. Some components are obscured in the photographs so do not be alarmed if it is impossible to make the number of components on the panel diagram tally with the photographs. We can assure you that the panel diagrams are correct.
R.F. FIELD
INDICATOR

R.F. Band: 455, 535, 1600, 640, 1000, 1400 KC. Sensitive Basics: 100 uA. Standard to 1 MHz. Frequency Accuracy ± 1%.

SPECIFICATIONS
DC Voltages: 0-5, 50, 500, 5000 V at 10,000 Ohms per volt. AC Voltages: 0-5, 50, 500, 5000 V at 10,000 Ohms per volt.

Accuracy: ± 1% at centre scale.

PRICE £8/10/-

Incl. Sales Tax.

TEST OSCILLATOR

SPECIFICATIONS (Tuned Circuit Type)

MODEL RH-B

Frequency Range
1 ch: 1-3.5 Mc.
2 ch: 3.5-9 Mc.
3 ch: 9-25 Mc.
4 ch: 25-90 Mc.
5 ch: 90-200 Mc.

5 Section, 10 extended.

Net Weight 190 gr.

Crystal: Microphone.

Operating instruction Sheet.

PRICE £8/10/-

Incl. Sales Tax.
carried out with tinned copper wire, cross-overs are essential. Remember to mount them on stand-off pillars. 

There is a danger when assembling the power amplifier chassis. Panel B is especially critical. The 3300 pF grid capacitor is connected directly across the coil terminals. The 3300 pF grid capacitor is mounted between the socket of V9 and the coil. Components not shown on the panel mounting screws are mounted on stand-off pillars.

The bias oscillator components is mounted on the preamplifier section and panel C or the power amplifier section. As before, all leads running to components above the chassis or at the other end of the deck may be left unsoldered until the panel is fastened in position.

There is a danger when assembling the chassis. Panel A may require alternative mounting methods. The main precaution is to keep the output plate leads to the transistor well away from the grid and plate leads. Other brands may require alternative mounting methods.

This applies particularly to the shielded transformers. The power amplifier wiring is quite straightforward and should present no difficulties. The main precaution is to keep the output plate leads to the transistors well away from the grid and plate leads.

The feedback resistors are mounted on a 5 lug tag strip fastened to the end wall of the chassis. Leads are run from the output to the appropriate lugs on panel A. As before, all leads running to components above the chassis or at the other end of the deck may be left unconnected although it will save time later if some method of coding the ends is attempted. Otherwise a tedious job with an ohmmeter is in store.

Having completed the main chassis wiring, the rest involves a fairly complex cable form. Details of this as well as switch wiper wiring diagrams will be given in the next article, when it should be possible to complete the assembly with a minimum of effort.

This photograph indicates the layout of the main components on the power amplifier chassis. Panel C mounts directly under the valve sockets while panel B may be seen attached to the vertical panel behind the level meter.
the effect may be reduced to a minimum.

so, there are a number of ways in which

people of all occupations.

back via the grid-plate capacitance. If

a triode amplifier stage falls with in-

Miller effect, Tom. whereby the gain of

relatively narrow band of frequencies.

served by using equipment designed to

motion in the tuning elements.

industries would be to obtain a sufficient varia-

for a switch?

If this is the case, we must reply rather

quencies on which they operate, Tom.

vaguely that they operate on" many fre-

use inductors in the load to provide

peaking at high frequencies, which lends

to offset the Miller reduction.

What kind of waves do

plumbing use?

Air waves, of course. What do you

think the wings are for?

We assume that you mean the fre-

quencies on which they operate, Tom.

In this case the answer is even less defi-

nite. The police naturally do not

encourage other fliers and for that

reason they operate on a variety of un-

spetified messages may be heard on a

normal shortwave set, however.

What waves do boats

use?

Ha! Ha! You asked for it that time, Tom. Seriously, though, there are a number of frequencies used. The International Distress frequency (apart from 500 Kc) is 2182 Kc, small boats operate

on 2574 Kc, trawlers and fishing co-operatives on around 4.0 Mc, and so on. If you tune from 150 to 75

metres, you should hear quite a deal of traffic.

What does it mean when an

online transformer is "split?"

Someone went berserk with an axe.

We've a bit puzzled by your meaning.

Type. At first we thought you might

mean the procedure of winding two in-

tulated secondaries on some driver

transformers, or even the system of in-

terleaving output transformer windings

to reduce leakage inductance. We came

to the conclusion, however, that you

are referring to the system of "spitting" a single-ended output transformer core by including an air-gap in the magnetic path.

This is done to increase the reluctance

of the transformer core, which reduces the

stealing effect of the D.C. plate current

flowing through it. This in turn generally

improves the power-handling capability.

Wire generators — would these operate from a battery

or must they be driven?

It depends . . . you must have a driv-

er's licence.

We assume that you are inquiring

whether a friction-driven bicycle alter-

nator connected to a battery and

piled as a motor, Tom. If so, the answer

is no, as the usual unit of this type is a

single-ended output transformer core

by including an air-gap in the magnetic

path.

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is no, as the usual unit of this type is a

single-ended output transformer core

by including an air-gap in the magnetic

path.
Almost ruin the cathode emission. Cathode poisoning is distinct from cathode deterioration due to positive ion bombardment, in which an actual physical deterioration of the surface occurs.

There are many sorts of audio transformers. Which is the correct design?

No. 21870723.

Yes, Tom, there is no all-embracing "correct" design, for there are many different types of audio transformer to do different tasks. Thus we have microphone matching transformers, driver transformers for Class B output stages, etc. Within each application the type of "correct" design will also depend upon a particular function for which the designer strives. It may be, power handling ability, frequency response, low losses or a host of other characteristics.

Electrical lamps — what is the highest voltage possible at the lowest voltage?

Oh, about 1,000,000,000,000,000.

This time, Tom, our wis, was about right! since the wattage is merely a product of the applied voltage times the current consumed, all one has to do is, low voltages is draw more current. This involves making very heavy, strong, slender wires, which is low in resistance and carry a lot of current without too much voltage drop.

Naturally, there will be a limit to the current one can draw, both from the point of view of the lamp and whatever power source is available. However, it would be possible to construct a lamp of, say, 1,000,000,000,000,000 volts, for a great deal of money and a special low-voltage power station.

Do you live in a DEEP FRINGE Television Area?

If so, then follow the examples of many others and install one of the famous Luft 2-valve Amplifiers, developed and manufactured in Western Germany. These amplifiers are high in quality and high in performance. Here is a case in point.

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ARPENI TRANSFORMERS.


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8. Dual Wave
9. Portagrop
10. Parts player
11. S/W Conv. (Batt.)
12. S/W Conv. (Batt.)
13. S/W Conv. (A.C.)
14. S/W Conv. (A.C.)
15. All Wave Conv.
16. All Wave Conv.
17. 50 M.C.s Conv.
18. 144 M.C.s Conv.
19. Playmaster Stereo Control Unit No. 9
20. Playmaster Stereo Control Unit No. 10
21. Playmaster Mono Control Unit.
22. Playmaster Tuner No. 3
23. Playmaster Program Source.
24. Hi-Fi 3 Amp.
25. Mullard 3-3 Amp.
26. Mullard 5-10 Amp.
27. Mullard 5-20 Amp.
28. Mullard 2-2 Stereo
29. Unit 2
30. Playmaster 10
31. Playmaster 17 w.
32. 13 Watt P.A. Amp.
33. 25 Watt P.A. Amp.
34. 35 Watt P.A. Amp.
35. Standard 10 Watt Guitar Amp.
36. Standard 20 Watt Guitar Amp.
37. Transistor 1
38. Transistor 2
39. Transistor 3
40. Transistor 4
41. Transporta 3
42. Transporta (Std) 7
43. Transporta (RF) 7
44. Transistor 8
45. Transistor B/W 8
46. Transistor 4
47. Transistor Stereo Amp.—2 Watt
48. Transistor Stereo Amp.—4 watt
49. “Golden Series” 10w Guitar Amp.
50. “Golden Series” 20w Guitar Amp.
51. Transistorised Signari tracer
52. Transistor 10w Amp
53. Transistor W/meter
54. 3” C.R.O.
55. 5” W/Range
56. Tacho
57. 12v Tacho.
58. Wide Range Audio Oscillator
59. Sweep Generator
60. D.O.O. Adapter
61. Pattern Generator
62. R/C Bridge
63. Valve and Transistor Tester
64. Electronic Stetho.
65. Stereo Headphone Adapter
66. Stereo Headphone Amplifier
67. Tape Amplifier No. 2
68. Tape Amplifier No. 3
69. “Unit 2” Stereo Amplifier
70. “TWIN 10” Stereo Amplifier
71. “Golden Series” 10w Guitar Amp.
72. “Golden Series” 20w Guitar Amp.
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86. Electronic Stetho.
87. Stereo Headphone Adapter
88. Stereo Headphone Amplifier
89. Tape Amplifier No. 2
90. Tape Amplifier No. 3
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£23/15/-

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1962 AUDIO GENERATOR
FULL KIT OF PARTS FOR THIS UNIT TO R. TV & H. FEBRUARY ISSUE
£29/12/6

ELECTRONIC DEVELOPMENTS
Phone: 63 5973 NICHOLAS BLDGS., 37 SWANSTON STREET, MELBOURNE. Phone: 63-5973

Radio, Television & Hobbies, March, 1962
For some time now we have been contemplating the description of a transistorised test oscillator. There are many applications where an oscillator of this type would be desirable, but where the conventional oscillator or signal generator is impossible.

In portable applications the conventional generator usually proves too bulky, and in addition requires power from the AC mains. In addition, battery valves have been used in such applications, but these too have drawbacks. As the dial scale shows, the three bands finally selected were the RF, broadcast and short-wave bands. These are the most often required of all the lower bands and, accordingly, the oscillator will be suitable for the majority of applications. As the dial scale shows, the three bands are 400-500 Kc/s, 0.6-1.5 Mc/s and 5-17 Mc/s, with a quite usable second harmonic available if required.

MODULATION

We decided to provide for both a modulated and an unmodulated output, with a separate audio oscillator rather than by allowing the RF oscillator to "squeal." This simplifies the provision of audio output signal for amplifier testing, in addition to improving the instrument accuracy and frequency stability.

After considerable experimentation, the unit described on these pages was developed. Possibly the best way to begin its description is by tracing through the circuit, pointing out the features of particular interest.

The main part of the circuit is the RF oscillator, using a drift transistor in a common-base circuit. The transistor used may be either a 2N470, a 2N571, or any other type which will oscillate over the frequency range concerned.

The tuning capacitor is a small single-turn unit having a range of 10-415 pF, and is fitted with a circular plastic dial over the frequency range concerned. The tuning capacitor is a small single-turn unit having a range of 10-415 pF, and is fitted with a circular plastic dial over the frequency range concerned.

To reduce the bulk of the oscillator circuit and enable the coils to be placed inside the crystal unit, the coils used are miniature enameled pot-cores. The pot-cores, manufactured by Ducon Industries Ltd., are not actually recommended for oscillator service but are used in tapped holes in the gang frame. A small aluminium clamp serves as the battery mounting.
The circuit of our transistorized oscillator. Only two transistors are used, but the unit gives stable operation and covers all the usual frequency bands.

Note that one coil is used to cover two of the bands, reducing the bulk of the instrument.

The prototype case was finished in a black "winkle" baked enamel, which produces an attractive yet durable covering. The enamel used was Brolite "Superior Wrinkle Finish." but any similar product would doubtless be suitable.

With finishes of this type, a small spray-gun is really essential — we used an inexpensive hand-operated type. After spraying the case with a primer, spray the wrinkle enamel in a fairly thick coat and bake for about half an hour at 260 degrees F. If the body of the box is

with a switch on the output attenuator control. This obviates the need for a separate control switch, and simplifies the control panel.

Finally, note the large-value electrolytic capacitor across the battery, and the 470 ohm resistor decoupling the supply to the RF oscillator. These components prevent degeneration due to battery deterioration and consequent supply impedance variations.

Mechanically, the instrument is constructed in a metal case measuring 4 1/4 x 4 x 2 1/2 in. The case is fitted with a "biscuit-tin lid" panel which is in effect the chassis, and supporting the components. The housing is provided by the chassis, and supports the components.
NEWS FOR COUNTRY TV SERVICEMEN!

GENERAL ACCESSORIES PTY., LTD. announce another release of the TV Service Manual. This is the first TV Repair Manual wholly prepared for the TV Servicemen.

FEATURES INCLUDE:

1. Circuit diagrams, chassis layout, and voltage charts for all National brands of TV sets manufactured in Australia.

2. Loose leafed for the addition of new circuits and information when released.

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for the task but open the windows for a while to ventilate the room! (Fumes are given off during the baking which are rather unpleasant if ventilation is not provided. The oven will not be rendered useless however, for this is quite temporary.)

To obtain a professional finish for the panel of the instrument we used white decal transfers, which contrast well with the black wrinkle finish. Recently released in this country by Electronic Supplies and Services, of 417 Crown Street, Sydney, N.S.W., these transfers are readily available at a moderate cost and make panel lettering an easy matter.

The majority of the smaller components are mounted on a metal bracket supporting the RF coils and the audio transformer. The bracket bolts to the front panel between the tuning capacitor and the other two main controls, as the photographs show. The tuning gang itself fastens to the panel via two countersunk 1/8in screws, which thread into tapped holes in the gang frame. Spacers made from larger nuts pack the gang out from the panel to provide clearance for the bearing prolusion.

The gang, as purchased, may not have the mounting holes tapped, but most constructors should be able to borrow a tap and tap wrench to do this job. Use an intermediate tap to start, and finish with a plug type. Take care that the plates are not damaged in the process. A miniature file will remove the edge of the gang to a useless size. A tap wrench will remove the plug type if necessary. The tuning gang itself fastens to the panel by two countersunk 1/8in screws, which thread into tapped holes in the gang frame. Spacers made from larger nuts pack the gang out from the panel to provide clearance for the bearing pillow.

The majority of the wiring should be visible from the photographs. In any case, the wiring plan should be brought into line, and correct any error with the trimmers, making sure that all parts are firmly bonded together properly, ensuring a low-impedance ground return.

Because the one coil is used for the broadcast and IF bands, the calibration of these bands should be done in a drift order. We suggest calibrating the broadcast band first, then the IF band, and then the other two. The actual frequency comparison may be performed in two ways. One way is to use the Lissajous figures method, comparing the oscillator and generator frequencies on a CRO.

The tuning capacitor and the other two trimmers will be required. This may be done easily by using the coil slugs at the lower end of each band and the trimmers at the high end, comparing the unit with a standard signal generator or reliable oscillator.

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GETTING STARTED ON SSB

Last month we discussed the advantages of SSB over AM and the methods used to produce this type of transmission. In this, the second article in the series, we describe the design and construction of the exciter portion of our transmitter and tell why the Phasing type of unit was chosen in preference to other methods.

By Keith Jelfcoat

Perhaps we should say right at the outset that the major reasons influencing our choice were those of economy and simplicity, rather than any technical arguments for or against either system.

We realised that, if this transmitter is to be duplicated by amateurs throughout the country, it must be: (a) technically simple so that it is not beyond the capabilities of the newcomer to the SSB ranks; (b) suffer no degradation of either performance or versatility due to its simplicity; (c) use materials which are easily available; (d) require no elaborate test equipment in order to get it going and maintain it in operation and, (e) be relatively cheap to construct so that it would be within the reach of all.

FILTER PROBLEMS

Quite early in the piece we realised that, if this transmitter is to be commercially acceptable, we would have to devise a filter-type transmitter that any ideas we may have had about simplicity so that it is not beyond the capabilities of the newcomer to the SSB ranks.

An obvious disadvantage of SSB transmission is that, if the transmitter was able to produce an output in the 14Mc amateur band. If we did so, we would need a large number of high-Q tuned circuits following the mixer to satisfactorily separate the closely related frequencies of 13.8 and 14.25 Mc. Secondly, we would have to generate an output frequency of 45.3Kc sufficiently stable in terms of frequency.

Another point against filter rigs, though it is of minor importance in comparison with those just discussed, is the number of high-Q tuned circuits required compared with a phasing unit.

As previously mentioned, filter units are difficult to adjust, and the amount of extra suppression is of any technical advantage to an amateur station is relatively small. By far the most important advantage of the phasing unit is that the transmission of much data among SSB enthusiasts is made much easier.

Most stations who were asked to comment on the suppression of the writer's transmitter reported an adequate opposition as excellent and none were able to detect any trace of carrier. Once a filter rig has been correctly adjusted it can reasonably be expected to remain in adjustment for a considerable period of time. A phasing rig, on the other hand, would have to be dismissed because of constructing a filter-type transmitter that any ideas we may have had about simplicity so that it is not beyond the capabilities of the newcomer to the SSB ranks.

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This underchassis photograph shows the major components and their relative positions. The layout around the balanced modulators, V1, V2, V8, V9 and V11 is quite critical and should not be changed without careful consideration.

The other hand, may require periodic adjustment of the RF phasing unit and carefully select the component values in the balance pots, associated with the AF audio section of a phasing transmitter. For this reason it is necessary to take into account all of these considerations and bearing in mind the fact that our transmitter must be capable of being duplicated quite easily and reasonably cheaply by Australian amateurs, we finally chose the phasing type unit.

In brief, (a) all of the components necessary for its construction and easily and cheaply available in this country; (b) no specialised test equipment is necessary for its adjustment; in fact, with its built-in audio oscillator, it can be aligned by using the station receiver; (c) it is simpler to construct than an equivalent filter rig.

A phasing rig, on the other hand, must provide some means of restricting the audio band width, otherwise its transmissions will not only be wider in band width than is desirable, but they will contain a fair percentage of distortion products, due to the limited range over which the AF phase shift network will work.

The block diagram shows the interconnection between stages of the transmitter.

The general arrangement of the complete transmitter, while the main circuit diagram shows the circuitry of the entire balanced modulator. The circuitry from the balanced modulators to the final will be given in the next article in the series.

If a comparison is made between this diagram and the one in the previous article, it is apparent that they are basically the same, although some "luxury" items have been added. These include such things as voice-operated control of the transmit-receive switching and an inbuilt tone generator for alignment of the phasing sections and "on the air" tuning.

Before we talk about such things as chassis layout and the mechanical details of the construction, it may be as well if we spend some time in a step-by-step...
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Radio, Television & Hobbies, March, 1962

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Although not a strictly necessary precaution, the passage of DC through the primary of this transformer is avoided through the use of a 22k plate load resistor for the valve and an isolating capacitor of 8 mf in series with the transformer.

In order to achieve the 2 to 7 input ratio for the AF PSN (audio-frequency phase shift network), a fixed resistor of 500 ohms in series with a 500 ohm potentiometer, having its moving arm earthed, are placed across the secondary of the transformer. The setting of this potentiometer is one of the adjustments governing the suppression of the unwanted sideband and will be covered at a later date.

The "Aswell" phase shift network is fitted with an octal base and the socket connections shown on the circuit diagram suit this unit. No attempt has been made to show the exact layout of this unit because this is one of the critical components in the transmitter.

If your workshop is equipped with a good audio generator, CRO and RC bridge and you have a large supply of 1 per cent resistors and capacitors on hand, then you could tackle the construction of the exciter circuitry. It is probably many amateurs will want to change our basic layout and make some changes to the circuit, to suit existing tanks and boxes.

Different types can be used for most of the valves and a good many of the other components but there are some things which should not be changed if trouble is to be avoided. An examination of the circuit will reveal these.

Commencing with the audio and the circuit shows that we have a three-stage amplifier, consisting of two halves of a 12AX7 and one half of a 12AU7. The general gain of the section is such that a medium-gain high-impedance microphone may be used, either crystal or dynamic.

Audio Response

The circuitry is simple enough, being straight RC coupling, but the value of the load resistors, coupling capacitors and following grid resistors are chosen to shape the frequency response broadly to the 300 to 3000 cycle limits, as required. If a reasonably high gain microphone is used, a 12AX7 could conceivably be used in place of the 12AU7.

Output from the audio amplifier stages is fed to the "Aswell" 90 degree audio phase shift network. The design of this unit is such that it requires to be fed with two signals 180 degrees out of phase, having an amplitude ratio of 2 to 7. Its input impedance is approximately 600 ohms and this is matched to the plate of the 12AU7 by the use of T1, which is a 20,000/600 ohms audio transformer.

At least two different brands of these transformers are available on the Australian market. They are arranged with two secondary windings which can be used in series or parallel to provide 600 or 150 ohm impedance.

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structed of this unit, but you would find that the effort was hardly worth the small monetary saving.

The 90 degree phase shifted output of this unit is at a high impedance and, in order to drop this impedance wise to a value suitable for the modulation of the RF from our crystal oscillator, we use the two halves of a 12AU7 (substitute would be a 6SL7) and the transformers T2 and T3. These transformers are identical to T1 but have their secondary parallel connected to provide an impedance of 150 ohms.

**BALANCING GAIN**

The output from these transformers requires to be 90 degrees out of phase but of equal amplitude, so a 500 ohm potentiometer is provided in the cathode of the 12AU7 to correct minor differences in gain between the two sections. This is another of the controls which must be adjusted to provide good unwanted sideband suppression.

The switch, S1, S1b and S1c transposes the primary of one transformer to provide upper or lower sideband transmission, switches the same transformer out of circuit to provide double sideband transmission and switches on the HT to the tone generator for alignment or tune-up purposes or the transmission of CW.

Does the idea of an audio tone producing a CW transmission seem a little strange to you? Actually it is not so strange when one considers the progress of the signal through an SSB transmitter.

Remember that our SSB transmitter removes the original carrier and one of the sidebands, so that the audio tone applied to the input actually produces a single carrier whose frequency is removed from the original carrier frequency by the frequency of the audio tone. By using a monaural key switch instead of our audio oscillator and off we can produce CW transmissions.

Proceeding further with our circuit diagram, the next thing in line is the crystal oscillator. This is a simple trapezoidal oscillator on 9MC and uses the other half of the 12AU7 audio amplifier. The reason for the choice of the 9MC frequency will be discussed later.

It will be noticed that, in addition to the normal tuned circuit (L1) in the plate of the 12AU7, there is an additional tuned circuit L2 which is mutually coupled to L1. These two tuned circuits constitute the 90 degrees RF phase shift network. L1 is adjusted to a frequency slightly higher than the crystal (in the normal practice of crystal oscillators) and L2 is adjusted to resonate slightly on the low frequency side of the crystal. The actual adjustment of the two coils has to be carefully set so that the RF output in the link coupling to each is of equal amplitude but 90 degrees apart in phase. This is the third and last adjustment which governs the suppression of the unwanted sidebands.

Each of these coils has a three-turn section at "L1D" and end and the two lots of audio (90 degrees phase shifted) are passed through these windings and fed, together with the phase-shifted RF, to the balanced modulator. The actual balanced modulator circuit is part of the next article and will be covered there.

**CHOICE OF FREQUENCY**

The choice of 9MC for the oscillator was not a random one but was picked on the basis that it is by no means original but has been used in CW for a number of years, for the same good reason.

There are two main approaches to the problem of creating a variable frequency multiband phasing type SSB exciter.

One is to use a hardwired VFO which covers each of the amateur bands in turn. This circuit clearly obviously the phase shift network of L1 and L2 must not be made to work over the full extent of the 9MC range.
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3. Single Crystal Earpieces. High Impedance,

2. Single Crystal Earpieces. High Impedance,

1. Single Crystal Earpieces. High Impedance,
each band without adjustment, so an RC
type of phase shift network would have
to be used with some degradation of
performance.

Because the action of frequency
doubling is essentially a non-linear one,
our VFO would have to oscillate directly
on each of the various bands and operate
each band (the correct values of R and C
would not be the same for any of the others bands). The first big
problem with such an arrangement would
be the stability of the oscillator. Can
you imagine an oscillator on 25MHz
which would not have more than, say,
100 cycles drift from dead cold to full
warm-up?

Such a thing would not be exactly
impossible but it would certainly be an
improvement on the performance of the average
amateur. And, even if we tolerated a
certain amount of drift during its warm-
up period, we would still be in trouble when it came to operating the unit on
the air.

If the VFO is oscillating on our operat-
ing frequency, then obviously it must
be switched off while we are receiving
for it not to interfere with the incoming
signal. During the period of reception,
the VFO would have to cool down and,
when again switched on, the transmitter
would be off frequency. It wouldn't be long before one would be
short of contacts with a sideline trans-
mitter like that!

DOUBTFUL PRACTICE

The fact that some commercially de-
signed amateur transmitters make use of
this principle does not alter our opinion
(see the technical facts) that it is an un-
satisfactory way to develop a sideline
transmitter.

The second method of generating the
final signal, i.e. by the use of a doubler
or multiplier, is much more satisfactory.
We are all familiar with the fact that a
single mixer valve and simply picking
9 plus 5Mc equals 14Mc and so forth.
All of this mixing can be accomplished
by feeding the two frequencies into a
tuned circuit and the VFO would begin to
operate as linear amplifiers they can
cure this drift by the right choice of
components in the transmitter. It means
that the transmitter is not complete in
one case but it does, on the other
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well away from the heat-producing com-
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resistor in series with this line ensures that the frequency response of the radio audio amplifier will remain within the desired limits.

The audio from the transmitter amplifier is applied to a triode (12A7T) and fed to the cathode of a series-connected diode (6A5G). The negative-going output from this diode is applied to the grid of a triode (12A7UT) which normally operates at zero bias. The resistor has a fairly low plate voltage. When a negative voltage is applied to the grid of this valve its plate current drops and its plate voltage consequently rises. Eventually a point will be reached where the voltage at the plate will be sufficient to fire the neon tube connected through a 620K resistor to ground.

The instant this neon tube fires, a positive voltage is applied to the grid of the second half of the 12AU7. This causes the triode and rectified diode to produce positive-going voltage at the grid of the 12AU7.

When correctly adjusted the system will thus operate on a signal which comes only through the microphone. If the signal arrives through the other channel simultaneously (as in the case when receiving) then cancellation takes place and the transmitter is not operated.

OPPOSITE POLARITY

When receiving, the signal from the loudspeaker is picked up by the transmitter microphones and, with proper adjustment of the input controls to each section of the Vox, will appear as voltages of equal amplitude at the grid of the first half of the 12AU7. Though of equal amplitude, these voltages will be of opposite polarity, causing cancellation and thus will not allow the Vox to operate.

Attack time of the Vox circuit is very fast and, in fact, is limited only by the mechanical delay of the relay. The hold or "delay" time of the unit is controlled by the voltage at the cathode of the neon tube and the result is that the delay is almost entirely due to the neon tube firing. A point will be reached where the neon tube will not fire.

Almost any relay having a coil resistance of 1,000 to 10,000 ohms can be used in the unit although, for preference, it should have a copper slug with the coil as part of the assembly. The lead for the volt-
Radio, Television & Hobbit, March, 1962

TELEVISION RECEIVER SERVICING

TELEVISION RECEIVING CIRCUITS: Start with the A.W. Broad- 
ham's revised Standard Edition)( wil- 
mate, B. Reit. The Lecture Series) of 
lished in two volumes) written primarily 
for radio service engineers who wish to 
achieve a thorough knowledge of tele-
vion servicing work. It assumes that 
the reader already has a reasonably 
good grasp of the principles of radio servicing 
and it extends this to the more complex 
circuits and techniques of television.

In the first volume, time-bases and 
their associated circuits are covered; and 
it is probably here that more than half 
the servicing problems likely to be met 
by the service engineer occur. The second 
volume deals with all the other sections 
of a modern receiver, including the video stage, 
timing circuits, sound channel and 
power supplies, and a large section 
concerned with aerial and signal distribution 
systems.

Although it is most comprehensive 
and certainly lives up to the publisher's 
claims regarding technical standard, the 
book deals almost exclusively with 
English circuitry, standards and practices. 
Thus it must prove for a limited application in 
Australia. Our copy came direct from the pub- 
lisher.

* * *

GUIDE TO TV TRANSMITTING STATIONS.

This useful guide (published in a series) 
was prepared by the publisher of the 
Radio and Television Week Books Ltd., 84 Gray's Inn, 
London W.C.1, 562-568.

PRACTICAL HOME-STUDY COURSE IN RADIO

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A.R.E.C. 1962

TRANSISTORISED RADIO RECEIVING CIRCUITS

(Continued from page 59)

merely a matter of listening for the 
zero-beat whistle. When the two units 
are almost equal in frequency a whistle 
will be heard, the pitch of this being 
determined by the difference in the 
frequency of the two. When the frequency of one 
is altered to correct the difference the 
pitch of the whistle will fall and will 
become inaudible at the point of equal 
frequency. By striking the dial past 
this condition the equal-frequency spot 
will be quite obvious from the whistles 
either side.

This completes the description of our 
newly transistorised test oscillator. In 
due course of operations we propose to 
buy several companion instruments for it, in similar 
cases, and to make public the field 
of transistor test equipment.

TELEVISION RECEIVER SERVICING

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due course of operations we propose to 
buy several companion instruments for it, in similar 
cases, and to make public the field 
of transistor test equipment.

This prevents the annoyance of a sudden 
noise cutting the receiver off while net-
work generator. Figure 1 shows the 
circuit, allowing the frequency of the oscil-
lar second method. This is simply an audio 
circuit, which may be used with any available audio ampli-
fier fitted with a diode mixer cir-
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2/6 each.
Preoccupation with our current electronic organ series has made it impossible for the editor to write his usual "Let's Buy An Argument" feature—and still have a holiday. But all is not lost. Staff member Janisol Rowe has come to the rescue with this discussion of circuit symbols, which may provide food for thought—and argument!

During the past years, a great many new electronic components have appeared on the Australian scene. Many components need new circuit symbols and existing symbols are limited, as well as modifications to existing symbols.

Unfortunately, some of the symbols which have appeared are open to query and it is time that all concerned sought those most logically based and standardised upon them.

Perhaps, at this outset, it would be wise to consider the essential qualities of circuit symbols. Primarily, the symbol for a component should enable that component to be identified easily. Ideally, the symbol should also indicate the class of component (i.e., whether it is a particular type of resistor, capacitor, inductor, semiconductor, valve, etc.).

As a secondary quality, the symbol should be simple to draw. After all, the idea of a circuit diagram is to show all connections in the electrical circuit without drawing elaborate representations of the components; this purpose would be defeated if elaborate symbols were used. Simple symbols also increase drafting efficiency by reducing drawing time and effort.

In the light of the foregoing, let's have a look at the various symbols which have been used for a common, yet relatively new device, the junction transistor. In general, two main symbols are in use, one originating from America and the other from Europe and Great Britain.

Figure 1 shows a simple sketch of the junction transistor, with some of the symbols used to represent it. The top row represents PNP types, and the bottom row NPN types.

The two symbols at the far left are common in American literature and, as you can see, are distinguished by the emitter and collector leads drawn at 45 degrees to the vertical. They also lack an enclosing circle.

In the centre are another two symbols, similar to the first set but having an enclosing circle, which distinguishes them from the rest of the circuitry. These symbols were used earlier in "Radio, Television and Hobbies," being also of American origin.

Finally, we have the symbols at the right. These seem to have found favour in Europe and Great Britain and differ mainly from the other type in that no oblique lines are used.

For accuracy of representation and therefore ease of identification, the last set would seem to be the best. The structure of the symbol closely approximates that of the component and, in addition, it suggests that the bulk of component current passes from emitter to collector, through the base. This is not suggested to the same extent by the other symbols.

Since this is achieved with no symbol elaboration, no compromise is involved. In fact, the symbols are simpler than the existing ones.
other types of transistor. (The so-called

transistor symbol can be adapted to the

transistor symbol can be adapted to the ^I^^X But the circle could conceivably have

'their connections, sign indicates light sensitivity, and the

two rna,n exten

device is the junction diode. This de-

vice is the junction diode. This de-

usually of considerable interest, it is most

shown in Figure 1. The small differences

between the various types also empha-

sise the fact that they are all members

of the one semi-conductor "family."

As yet, the symbols shown in figure

as ohmic resistors, most capacitors, and

sising the symmetry of the device and

vice, in its many (and steadily growing)

vice, in its many (and steadily growing)

between the various types also empha-

sise the fact that they are all members

of the one semi-conductor "family."

of the one semi-conductor "family."

device, is usually represented by the symbol

would seem most suitable for this task,

Let's look at a little closer, as I hinted

The double Zener diode can similarly

The double Zener diode can similarly

The Tunnel diode, with its extremely

The Tunnel diode, with its extremely

Another type of diode is the Varicap,

Another type of diode is the Varicap,

The symmetrical transistor can be

The symmetrical transistor can be

A tetrode transistor, for instance, can logically

A tetrode transistor, for instance, can logically

The Tunnel diode, with its extremely

The Tunnel diode, with its extremely

The symmetrical transistor can be

The symmetrical transistor can be

The basic diode form, used as a detector

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The Zener or breakdown diode is commend

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Another relatively new but common
device, in its many (and steadily growing)

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ARMIES OF AMPLIFIERS
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Radio, Television & Hobbies, March, 1962
would be involved is the thermistor, or negative temperature coefficients resistor. To do this has been represented in this magazine. It has the disadvantage that it is relatively hard to identify, as it does not directly suggest temperature dependence. In addition, it does not have the enclosing circle to indicate non-linearity.

This latter requirement is satisfied by the other two symbols. The last symbol, however, still retains the significance of the sole suggestion that the device is dependent upon temperature. This can lead to ambiguity. For instance, a dot has been accepted as the symbol in a valve meaning that there is other than a vacuum inside. If one were consistent, one would supposedly have to deduce that the device represented by the symbol in 4c is a non-linear gas-filled resistor.

The second symbol would seem to satisfy the requirements of a suitable symbol. It has an enclosing circle, signifying non-linearity; the internal zig-zag makes no doubt to the fact that it is a variable resistor, while the sign implies that the important parameter is temperature, affecting the resistance in an inverse manner. (Strictly, K should be used for temperature, as T may be confused with the T used for tubing devices.)

TO BE CONSISTENT

Resistors which exhibit a marked temperature non-linearity in the positive direction should also be classed in with thermistors, to remain consistent. However, most of these devices are in the form of small electrical lamps, which produced the usual electrical measurement shown in Figure 1a.

To be consistent with our symbols, however, we should use that shown in Figure 2a. It is basically the same as that used for the other thermistors, but with a sign indicating a drop in resistance with increasing temperature and resistivity. Also note that the lamp symbol could be used for temperature only if it could be continued in to make a non-linear resistor.

Resistors which are non-ohmically linear are known variously as non-linear resistors, variac's, or metros. These cannot adequately be symbolised in an easy way since there are many different varieties and in some types the current which flows through the coil is increased with increasing temperature. A method of symbolising non-linearity; the internal zig-zag makes no doubt to the fact that it is a variable resistor, while the sign implies that the important parameter is temperature, affecting the resistance in an inverse manner. (Strictly, K should be used for temperature, as T may be confused with the T used for tubing devices.)

The best that seems possible is to settle upon a symbol which conveys as much information as possible and to try to satisfy the requirements of a suitable symbol.

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A new transistor (AFB20) is illustrated below, and a high band adjacent channel suppressor (not shown) consisting of two high Q absorption traps. These transistors feature excellent uniformity of characteristics, and low feedback capacitance. These features, in addition to very close manufacturing controls for small signal parameters, make these units especially useful in the audio and video fields where they can be used as a guard in machine tool guard, cloth and paper monitor, and hard to lock-in machine practices in continuous industrial processes which, if necessary, can replace the regular case lid. A range of all the R., TV and H. major projects, Heating Systems Pty. Ltd. have recently released a new batch to suit the latest designs. Those illustrated in the picture are housed in a substantial steel channel with a 70 deg. C and vibration is not a problem. The temperature range within which the equipment is dependent upon the opacity of the material to be kept under constant scrutiny as it emerges from a machine. Further inquiries should be directed to the manufacturers, Messrs Amalgamated Wireless Valve Co. All are of the drift field type, constructed from germanium p-p-n alloy. The 2N1637-8-9 group was designed specifically for use in very low power video receivers, and is intended for use in point-to-point video receivers. The 2N1632-4-6 type is available from Ronald J. T. Payne Pty. Ltd., of 385 Bridge Road, Richmond, Victoria. For $1.25 each, the 2N1632 can provide excellent performance in a broadcast band, while the 2N1634, a drift type transistor is excellent. The 2N1635 provides continuous performance in a broadcast band, and is available for $0.018 each. The 2N1637-8-9 are available from Channel 2 for $0.02 each. The 2N1637-8-9 are available from Ronald J. T. Payne Pty. Ltd., of 385 Bridge Road, Richmond, Victoria. For $1.25 each, the 2N1632 can provide excellent performance in a broadcast band, while the 2N1634, a drift type transistor is excellent. The 2N1635 provides continuous performance in a broadcast band, and is available for $0.018 each. The 2N1637-8-9 are available from Channel 2 for $0.02 each.
The latest in a line of service instrument releases from Jacoby Mitchell is this attractively packaged vacuum tube voltmeter. Similar in appearance and electrical specifications to a number of "killed" instruments which are available in this country, it has some features which make it superior to most other instruments of its type.

**New Transistorised Metal Detector**

A NEW HIGH-SIGNIFICANCE METAL-DETECTING INTERFERENCE is possible in America from Amalgamated Wireless (Australasia) Limited, Sydney, and London, and is known as the "M-Scope". The "M-Scope" is a metal detector primarily to locate and trace metal pipes buried up to 10 feet deep due to its useful sensitivity for finding suitable conductors of metal objects in roads and pipelines or other metal objects in spaces such as cable, conduits or metal objects in walls and pipes.

The instrument was also to be used to locate high-tension cables, metal conduits can be thrown into a commercial metal detector, for finding suitable conductors of metal objects in roads and pipelines or other metal objects in spaces such as cable, conduits or metal objects in walls and pipes.

The "M-Scope" consists of a transmitter which can be thrown into a commercial metal detector, for finding suitable conductors of metal objects in roads and pipelines or other metal objects in spaces such as cable, conduits or metal objects in walls and pipes.

The "M-Scope" is available in this country, it has some features which make it superior to most other instruments of its type.

**pickup Arm**

Type SMG.212

For exchangeable heads. Due to its special shape, the pickup arm turntable levelling is unnecessary. This may be useful for up to 50 degrees out of level. Ball bearings are applied for both horizontal and vertical action, ensuring trouble-free performance even at the lowest possible style force. Height over mounting plate is adjustable. Suitable for type SMG.212.

Simon Gray Pty. Ltd., being National Distributors for all ORTOFON products, are proud to announce that ORTOFON Pickup Arms and Heads are now in use by the majority of Australian Sound Broadcasting, Television and Recording Companies. Because of their superiority and reliability, they also suit other high-quality pickups on the market.

**ORTOFON Cartridges**

FULL RANGE AVAILABLE

Now for the first time a Hi-Fi stereo cartridge of unsurpassed performance complete with built-in transformers. Produced to the highest ORTOFON standards, this cartridge will match into virtually all amplifiers and equipment without needing pre-amplifier or other stages.

Model SPU-G/T

Details of performance include:

- **Channel Separation**: 20.2 dB
- **Frequency Response**: 20,000 cycles
- **Tracking Pressure**: Below 2 gms
- **Compliance**: 100 cm/dyne

Also Available:

- **Shell with built-in transformers also available.**

**Shure Cartridges**

Details of performance include:

- **Channel Separation**: 20.2 dB
- **Frequency Response**: 20,000 cycles
- **Tracking Pressure**: Below 2 gms
- **Compliance**: 100 cm/dyne

Also Available:

- **Shure Pickup Heads Type SPUA in Standard 'A' Shell without transformers.**
- **the world-famous Type 'C' Mono Cartridges in either 'G' or 'A' Type Shells;**
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All the above models are now used by the majority of Australian and Overseas Broadcasting Stations.

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SCOOP PURCHASE OF MANUFACTURERS STOCK OF TRANSISTOR COMPONENTS ENABLES US TO SUPPLY THIS KIT AT NEARLY HALF PRICE.

The complete kit of parts for the Transistor Six includes 6 transistors, printed circuit board, coil kit, Magnavox 4T speaker, Ferguson transformers, battery and all necessary parts to complete the set, including an attractive plastic covered case.

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APPLICATIONS:
The sensitivity of this instrument is such that an R.K signal of a few mV fed to the input circuits can be traced through the whole equipment. The signal meter 500 mV is most useful in tracing faults in Leaks equipment, transformers, etc. and transistor amplifiers. The accuracy is

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THese new 4 speed record changers are equipped with high fidelity crystal pickup and sapphire needles. Can also be used as a manual player.

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Radio, Television & Hobbies, March, 1962
TOSCANINI RE-MADE IN STEREO

Easily the most interesting item on the record front, this month, is the local release of two Toscanini recordings, which have been re-processed from the original mono tape masters into a "stereo" form. The idea holds an interest, both for Toscanini's many admirers, and for the technical background to their production.

By Neville Williams

TOSCANINI and the N.B.C. Sym-phony Orchestra are names which need no qualifications in the musical world. But technically and commercially, the idea of stereo reproduction was interposed by Toscanini's temperament and evolution of the new medium. Two more commercially important huge N.B.C./R.C.A. organisations which promoted the idea. Toscanini, born from the podium for the last time, the sun of domestic stereo sound reproduction was just peeping over the distant horizon.

Recording engineers, though far from unanimous on the details, were beginning to concede the wisdom of making multitrack tapes of all recording sessions, of keeping every recording session against the day when they might well be needed.

But for Toscanini, the dawn came just too late. A couple of years more and he might well have left a heritage of the Toscanini tradition in the new medium, along side his older mono recordings. As it was, the only Toscanini performance ever recorded in stereo are on the tapes of his two farewell concerts, on March 31 and April 4, 1943.

The rehearsal for the March concert, featuring the "Pelleas," proved a triumph for the 87-year-old maestro, and even the human voice, working purely from audio oscillograms, was taped — demonstrated only his failing strength.

DISAPPOINTING RESULT

The live concert, a Widney program, was similarly masterful and gave every technical limitation as the conductor as he had been in the studio. Though the performance was satisfactory, the result was disappointing. stereo and mono versions alike were withheld.

Nevertheless, after Toscanini's recordings were re-processed, they would pass as stereo? Toscanini's orchestra could logically be visualised as having all the violins on the left, the violas and cellos on the right, the woodwind, brass and percussion centralised for his pur-poses. As far as could be determined from this to have been the left channel reproducing all instruments above 2,000 cps and above 3,000 cps.

EXPLANATION

In an article in "High Fidelity Maga-

zine" Somer, a young 23-year-old engineer, explained the thinking behind this highly anomalous and disturbing method of making a stereo disc. Such was the appeal of the new medium to music lovers that, means existed for transferring into something authentically recorded and commercial and musical value.

Somer knew, for example, that Tosca-
nini's orchestra could logically be visualised as having all the violins on the left, the violas and cellos on the right, woodwind, brass and percussion centralised for his purposes, and further back.

By feeding the mono signal through band-pass filters, it was possible to arrange for the sound from the violins to be reproduced below 1000 cps and above 3,000 cps, with the higher sound of the remaining instruments, carrying somewhere to the right.

Somer spent hours listening to simple frequency-split reproduction of Toscanini tapes, trying to decide how best had the spectrum could be divided for his pur-

poses. As far as could be determined from this, to have been the left channel reproducing all instruments above 2,000 cps and above 3,000 cps.

The So-Me concept of a stereo disc, as it was in 1958. Means, therefore, had to be provided to the frequency division according to the pre-set intentions of the record producer. It thus became essential to mix the contents of each split, retaining low frequency response, etc., to meet special situations.

'Enough overlap were arranged between the high cut-off on the left and the low cut-off on the right, a large portion of the mid-range winds, winds, brass and percussion, were arranged equally between channels, thus permitting the frequency bands to pass without overlap.

Somer found, in practice, that present frequency cut-off filters were not suitable for this purpose, and were not suitable for any entire work, with its similar effects in one medium were off-

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'Enough overlap were arranged between the high cut-off on the left and the low cut-off on the right, a large portion of the mid-range winds, winds, brass and percussion, were arranged equally between channels, thus permitting the frequency bands to pass without overlap.

Somer found, in practice, that present frequency cut-off filters were not suitable for this purpose, and were not suitable for any entire work, with its similar effects in one medium were off-
The New York Herald Tribune reported: "The recordings offer shaper and cleaner sound than any previous Toscanini discs." The Record Buyer magazine commented, "They come appreciably closer to the vibrations and impact of a Toscanini performance than anything historically available. All of which sounds very impressive but, frankly and speaking from a purely technical point of view, I feel they overstate the end result.

Lacking the original mono equivalent, against which to compare the Dvorak disc, I am ready to concede that the reprocessed version does contribute something desirable in the way of spatial effect and the enthousiasm may be warranted, provided the comparison is restricted to one between the new and the.

On this basis, those with a predilection to the Toscanini readings might find much in the new discs to delight them, while those whose ears remain conscious of technologicalities will be less enthusiastic. The re-processed sound has a certain 'spread' but it is a far cry from that clearly sculptured wall of sound that is the hi-fi enthusiast's concept of modern stereo.

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Is this last comparison reasonable? In one sense, it may not be, but only in one sense. The history of record sales indicates that buyers have consistently preferred modern versions of classical works to the older, technically limited versions. I doubt that, considered on a hi-fi basis, these re-processed Toscaninis will reverse the order. Over and above the mere attainment of stereo effects, there is the very real problem that the basic quality on tapes even a few years old is often wanting by modern standards. By the time the inevitable distortions from replaying, "doctoring" and re-recording are added, then reproduced on two independent channels, background noise and total distortion are more than likely to pose a problem.

Overseas, the Dvorak Symphony has been mentioned as the most successful of the three re-processed discs, but I could not rate its general quality as more than "acceptable." It falls in that no-man's land of quality where it should sound normal enough to people with less elaborate stereograms but unsatisfying to those with wide-range equipment.

On stereo headphones, as one might imagine, the limitations of Somer's alchemy are apparent. The sound struggles valiantly to expand from the one spot right in the centre of the listener's head, characteristic of headphone mono; but it never darts off to right or left, beyond the ears, as it does with true stereo.

On both headphones and speaker, the difference between playing the re-processed disc in "stereo" or "mono" is quite marked, but I doubt whether the contrast is a valid one. The mono sounds so emaciated that I tip a lot of cancellation goes on when the "doctored" channels are merely paralleled. The only fair measure of what has been achieved would be to play the original mono against the re-processed version, on the same equipment.

If I seem to have devoted a lot of space to one disc, it is only because I believe it to be significant technically. There has been much talk about re-processing classic mono recordings for simulated stereo. This record comes as a concrete example of the best one of the big companies has been able to do to date. Time alone will indicate its acceptance. But already it has become evident that only the very best mono recordings are worth considering for reprocessing, using the techniques here involved. Ideas of delving back into the more distant past and revitalising classic recordings from the various fields of music seemed doomed to failure. There has been no talk, from H.C.A., of any more re-processed discs, which may be significant. If you want one, as a collector's item musically or technically, now might be the time to buy.

But, unless I miss my guess, the manipulations which were wishfully devised for the Toscanini library triggered the R.C.A. development which we discussed recently in these columns—R.C.A. "Stereo Action." This is right at the other end of the scale, musically, but technologically the same kind of engineering delights are involved—knobs, switches, cue lights and the works! No sacred tradition here, and electronic gimmickry becomes a medium of artistic expression.

It's a funny world—funny-peculiar, that is!
Turandot—An outstanding Record

Pruccini—Turandot. Complete Opera. BIS Records, BIS-8201.

The composer of Turandot, Puccini, has left us a major new opera, being. He left behind sketches which, had he not died, would have been developed into a complete opera. The composer died, but the work was not left unfinished. Puccini set about the task of completing the opera, but it was not until the last moment that he was able to do so.

Harmonically, however, it is Puccini's most advanced work and he achieves the oriental touch very cleverly, sometimes by using authentic Chinese scales, sometimes by exotic scoring with drums, gongs and various percussion instruments.

The work does not always sound out of place, but there can be no doubt about the success of the present disc.

OTHER RECORDINGS

There are two other complete recordings of the opera, by the company Columbia, with Madame Callas. Neddza to say that the Callas recordings are better in many respects, but her high notes are terribly wobbly and the heroine's opening aria is extremely difficult for her. She also has the problem of language and is not always convincing as Liu—doubtful because the singer's steady vocal emission shows up the uncertainties of the text.

The present set, with Enrico Burch, is a fine one. Miss Borkh is a reliable and sympathetic singer, and she shows signs of strain in some parts. She had a very fine voice, but it was not always as clear as it might have been.

The Debussy-Del Mar set, with Madame Tebaldi, is excellent. She sings the title role with a warm-hearted human being. Her voice is perfect, without strain. The famous aria, Nessum Dorma, is perfectly steady. When she sings the aria, she shows us the emotion and passion in her voice. She is another person with a great acting ability.

The recording, which is by Decca, is a most accomplished pianist. Gaby Casadesus in Paris in 1927, and the pianist played the piano for many years at the Paris Conservatory. He is said to have been in a very special state when he visited Australia, he had become careless of the keyboard and was unwilling to experiment in its further development. This last section has a crescendo; the last note, held out longer than almost anywhere else. Sir Thomas achieves a masterly richness of tone which is not evident in other recordings.

The playing of the Royal Philharmonic is excellent. The conductor, for the section does not drag on.

Richard Strauss—Ert Heldenleben. Sir Thomas Beecham, Royal Philharmonic Orchestra, played by Cortot. Following him, Gieseking did recording is an everlasting tribute to the composer and his work.

Debussy—Préludes, Book I, Jean Camus, R.C.A. M. 4316.

Most people probably never think of Debussy as a pianist, but he wrote some of his finest work for the piano. He studied the music of Debussy as a pianist, and he wished to see his music preserved. He studied the music of Debussy as a pianist, and he wished to see his music preserved. He is said to have been in a very special state when he visited Australia, he had become careless of the keyboard and was unwilling to experiment in its further development.

The Preludes were first popular with Bartok, and they are still popular today. They have given the pianist a chance to show his range of emotions and his ability to express them. They have also given the pianist a chance to show his ability to use the keyboard in a new and different way.

The Preludes were first popular with Bartok, and they are still popular today. They have given the pianist a chance to show his range of emotions and his ability to express them. They have also given the pianist a chance to show his ability to use the keyboard in a new and different way.

The performance secured was certainly worth the trouble. It had never before been heard in Australia, but it was most welcome. The musical picture of the composer's art was too long and the battle was lost.

The playing of the Royal Philharmonic is excellent. The conductor, Sir Thomas Beecham, did recording is an everlasting tribute to the composer and his work.
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He went to the United States in 1940 and has had a very successful career there and in Europe.

He is well equipped technically and is generally very sensitive to the diverse needs of the violinist. He follows the composer's markings very faithfully and does not dare to change them even in time. So many pianists pull the timing of the composer's work about. This is quite excessive, for he had a very subtle sense of rhythm and the music should be played as written.

The second Prelude, Variés, is one of the few works in which the composer uses the whole-tone scale continuously, except for five bars in D flat major. One can detect a feeling of mystery in this work as it limits the harmonic possibilities.

Les Collines d'Anacapri always is a test piece in piano recording, but the performance is completely successful, as is the brilliant and judicious Le Quai de la Veste sur le Vent D'Ouest. The popular La Fille Au Chene is Bruckner's most capricious and La Serénade is like a的变化 in the piano's theme of human. The recording is splendid and, although these works explore the two extremes of the keyboard, the tone is always rich and resonant.

**Brahms—Symphony No. 2 in D major**

Klemperer, however, shows that, in spite of its generally lyrical character, the work has force and dramatic contrasts and that the pianist's sense of humor. The second one is almost all grace and cheerfulness and this is in aspect of the work not emphasised on many recordings.

Klemperer uses the whole-tone scale continuously, except for five bars in D flat major. One may And his tempos rather slow at times. Some people can still be missed by most conductors. Some people may find his tempos very fast at times. The first 50 bars of the first movement he allows to flow on very easily and then he begins to show his impressive strength.

The inner parts are always allowed to sound clearly, the orchestral textures thick and one is aware of the crotchets in the bass of the first bar, which form a motto theme for the entire work. The second movement opens with a theme for the composer, which is really presenting two themes at once, the first a downward phrase on the bassoons. The composer is describing the lovely Scottish girl he has met and I feel that more sensibility could have been displayed.

The well-known Scherzo is not allowed to drag. La Danse De Puck is most capricious and La Serénade about the composer's theme of human. The recording is splendid and, although these works explore the two extremes of the keyboard, the tone is always rich and resonant.

The second one is almost all grace and cheerfulness and this is ap-
Debussy. The speed seems exactly right. The last ly intelligent and hard working and also but his performances always sound old Italian songs but they seem to lack conductor's vitality drives it along so that addition to her large repertoire of songs, movement is a masterpiece of technical very musical.

Sibelius—Symphony No. 1 In E Minor. The spirit of the music seems up. It is generally thought that Brahms wrote his first symphony, Borodin dis- tended—beneath the surface, the love is absent.

The first symphony contains all the orchestral devices, such as the fondness for Ostinato figures and for the lower register of the woodwind which are a feature of the music. The forces of nature which are said to pay such an important part in the composer's music are not underlaid on the first side and one has to juggle with the controls to keep everything clear.

At the present concert under the con- ducting tells how Professor Gerald Alva- ham has traced a great resemblance be- tween the first symphonies of Sibelius and Brahms—and I care less for her adven- tures in this type of music than in any other. The spirit of the music seems quite to elude her and, once again, I feel it is due to the ultimate meaning of the words not really affecting her: The Vain Suit of Brahms is done with- out a real sense of humour. In the Fauré songs she never sounds like a French woman and the curious colour and subtlety that the French language gives to an organised whole and then dissolved the material back into its original frag- ments. However, the tower of the present con- cert, Sir Malcolm Sargent is rather more restrained than usual. The forces of nature which are said to pay such an important part in the composer's music are not underlaid on the first side and one has to juggle with the controls to keep everything clear.

Chopin—Nocturnes: complete. Arthur Rubinstein. RCA Mono. L16399, L14099. It is well known that Chopin got the name of the nocturne from the painting by John Field, the Irish pianist and com- poser whom he met in Paris. He must be admitted, however, that Chopin made particular use of his own and his nocturnes are among the best of the romantic music. I had the Rubinstein recording of the first half of the nocturnes some time ago, but this time, he has recorded the whole 19.

The nocturnes vary a good deal in form. The most popular one in F Sharp Major (Op. 15 No. 4) is always great and his technique impres- sive, although he cannot match No. 4 and 14 very interesting. The delicacy of the performance is at its peak when he is in a good mood and made cuts. Rubinstein plays it all as well as they are possible to play. The idea of the nocturne is always great and his technique impres- sive, although his performance is better when he is in a good mood and made cuts. Rubinstein plays it all as well as they are possible to play. The idea of the nocturne is always great and his technique impres- sive, although his performance is better when he is in a good mood and made cuts. Rubinstein plays it all as well as they are possible to play. The idea of the nocturne is always great and his technique impres-
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Radio, Television & Hobbies, March, 1962
agitated mannerisms in "His Eye Is On The Sparrow."

The remaining two tracks by the Carpenters, "Just A Littleubbnd" and "The Twenty-Third Psalm," follow the well-known pattern of Billy Graham"s choir presentations.

Notable throughout is the excellent instrumental support and arrangements. Quality-wise, the record is good overall. Again, for some surface noise. In short, for the intended audience—followers of Billy Graham dramatic productions (WNW).

**Stage and Screen**

Rodgers and Hammerstein—The Sound of Music. The Flower Drum Song. Florence Henderson with orchestra and his"s orchestra. RCA. Camden. CAS 94.

"The Sound of Music" and "The Flower Drum Song" are two very successful musical productions for which Rodgers and Hammerstein provided the score and libretto. The record consists of five songs from each production. The music is rather zippy and not very original in the piano and the singer. Florence Henderson, does little for it beyond singing in tune and with clear diction.

I do not know whether the scoring used is that of the stage production, but it is very ambitious and well played by Sid Bass and his orchestra. Well recorded. (R.F.)

ODETA AT CARNegie HALL. Solo—accompanied on guitar, with Bill Lee (String Bass) and the Choir of the Church Of The Master, conducted by Dr. Theodore Stent, Minster, Vanguard YVR 976.

Recorded, for the most part, at Carnegie Hall on April 8, 1960, this record comes as a climax to a brief six-year career, during which Odetta has won wide acclaim for her presentation of authentic Negro folk music.

Her presentation certainly contrasts more strongly with the usual Negro spiritual material, modified or "interpreted" to have more immediate appeal to "white" ears.

With a voice almost masculine in its quality over the lower register, Odetta's singing is at times meditative and soulful; at times deeply passionate, backed by her own excellent guitar. Everything, including the diction, is subversive to the musical phonology. Such are the relevant facts. What of the impact of the disc? Personally, apart from one or two tracks, I found little in the disc to enjoy, in the superficial sense of the term, not because of any shortcoming of Odetta's part, but simply because the music is part of a tradition and so...
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Radio, Television & Hobbling, March, 1962
Tunga" from Portugal and a delicious "Cock Robin" from England. And, of course, folk music from the North American get its share of attention. These are men who know how to sing and enjoy doing it. Recorded at Webster Hall, New York, the sound is uniformly excellent. (W.N.W.)

GEMEN STERIWER SONGS
Volume 4, Erich Kess, with Chorus and Orchestra of the Vienna State Opera, conducted by Anton Pavlik. Mono, Vanguard (Recordings for the Connoisseur). VRS-1045.

Superficially, one might wonder why Anglo-American record buyers would be interested in a collection of German University music—more than that, why the interest should be sufficient to support a whole series of such discs, of which this is the fourth and not the last.

The answer lies partly in the fact that these are not just trivial student songs. Rather are they drawn from the rich body of German folk melody, which is interwoven with the whole tradition of German music itself. For the most erudite background to each song—eighteen in all—is given on the jacket. A separate sheet, inside, carries the original text and a line for line English translation.

But the appeal of the music is not just academic; the tunes are delightfully melodic and varied. Fitch Kins has a fine bass voice, with excellent diction and brings to bear the vitality, the tenderness and the humour which each song demands. Excellent support too, is provided by the Chorus and Orchestra of the Vienna State Opera under Anton Pavlik. A trace of tape is here the only point of criticism I have to offer of this otherwise excellent recording.

In short, a worthwhile addition to any representative record library. (W.N.W.)

★ ★ ★

SOUNDS FOR SICK PEOPLE, Featiting Al Cavala and Georgia Auld with the Shell Quintet, Stereo, WC-B-1214. (Also available on mono.)

What do you expect to find inside when you come across a cover adorned by a green-skinned, pink-eyed, bed-ridden creature from Mars? When you try to follow two columns of jargon notes that mean precisely nothing, written by a fellow calling himself Bill B. Better! Gradually it Swains that you have been served with the ultimate in gimmickry, in finding a name for a new LP album. To be purely matter-of-fact, this is an album of titles, which all have some direct (or indirect) allusion to bodies, bones or beds.

The music is contrived by a quintet plus (organ, tenor sax, drums, alto sax, trombone, guitar, flute) with players who like making gimmicky noises and laughing into their mouthpieces. Not bad—if you like the sort of thing Technically, the recording is very good. Even the vinyl has been cured! (W.N.W.)

★ ★ ★

ALPENLAND, FERJENLAND. Mono, Pacific, the Connoisseur). VRS-1045.

I'd have been able to make more inflected comments on this disc had someone by me to translate the
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GOLD ON SILK: The Ray Wright Orchestra, featuring Will Bradley (Trombone), Doc Severinsen (Trumpet), Jimmy Chambers (French Horn), Don Butterfield (Tuba), Mono Everest EL-30,038.

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Photo shows GTV-9 personality Panda using Fi-Cord to interview actress Maureen O'Hara in Hollywood for subsequent broadcast over Channel 9.

Radio, Television & Hobbies, March, 1954
**JAZZ AT THE EMBERS.** Personnel—Bobby Koenig (tenor), John Melofsky (trumpet), John Collins and drummer Lee Young, guitarist, bassist Charlie Harris, guitarist. Featuring the solo trumpet work of Harry Edison. The musical direction is by Day, "Bag's Groove," "Anthology," "Foggy Day," and "Stella by Starlight." Generally speaking, individual performances are good with the atmosphere sometimes building to peaks of intense excitement and, inevitably, the occasional "goof" which jazz musicians will sometimes build to peaks of intense excitement and, inevitably, the occasional "goof" which jazz musicians will make when they are really reaching for something.

Technically the disc is only fair. It is a pity it was not recorded under more ideal conditions available at one of the more, the least of the disc is an illness, but no worries need be felt on this score. The performance at the "Embers" nightclub of unison first and last choruses, with special arrangements were used, most in the small group "modernist" style. No variations from track to track caused by different techniques and etc. The numbers conforming to the usual pattern of union the bank.

The Sunny Side Of The Street," "You Must Be joking," "Little Miss," "Barbara Allen," "Lolly-Too-Dum," "Dublin City," "I Know an Old Lady," "Madly Malone," "The Wealthy Old Maid," "Davilly Mary." "Lisa Jane." Festival, Mono. FL-30,691. Nat is accompanied by his regular group. Festival, Mono. FL-30,691.安抚之 supplying the voice of Nat, as he sings on all of the numbers on the disc. His famous acceptance as a fine vocalist Nat King Cole seldom reaches heights of the quality is good with now and again

The numbers are: "Jeepers Creepers," "I'm Happy," "Caravan," "It's Only a Paper Moon."

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The Sunny Side Of The Street," "You Must Be jokes...
That's right. Slay the High Price Dragon. Get full value... Encel value... for your trade-in. Trade-in your obsolete mono equipment—you'll be surprised how much Encel Electronics will allow you. Let's have an example:

(a) Your old mono Leak... trade on a new Leak stereo Amplifier and control unit—you'll have a MAXIMUM of £.77 to pay. How's that for value?
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Pioneer Amplifier, with stereo tuner and Short wave bands, with Labcraft 605 turntable, All Balance arm with stereo diamond cartridge, two Wharfedale 6ix speakers... only £98 complete

As above, but with Labcraft 575... only £85 complete

As above, but with Orpheus Silex and Ortophon SPU, in Ortophon stereo arm. Only £114

As above but with Nytone 2000 amplifier. Only £109

All prices include sales tax. We will freight anywhere. Write for our quote on any equipment—and send for our free stereo brochure.

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Radio, Television & Hobbies, March, 1962
Amateur Bands With Bill Moore

Wireless Institute Convention

Annual conventions held by Divisional Councils of the WIA are events always well attended. There has been no dropping off in popularity of these gatherings in the post-war period.

The Amateur Bands section of the WIA contained the Audience. WIA's Division 2 held the usual event. In January the N.S.W. "Pullout forward to Sunday" was held. The course was conducted in heats and the ultimate event was a mobile unit. The competitors were divided into heats, the first two in each being knocked out. It was only after the first round that the morale declined. The final event was conducted in heats and the ultimate event was a mobile unit. The competitors were divided into heats, the first two in each being knocked out. It was only after the first round that the morale declined. The final event was conducted in heats and the ultimate event was a mobile unit. The competitors were divided into heats, the first two in each being knocked out. It was only after the first round that the morale declined. The final event was conducted in heats and the ultimate event was a mobile unit. The competitors were divided into heats, the first two in each being knocked out. It was only after the first round that the morale declined.

The N.S.W. Federal Committee for 1962 was also elected and the usual arrows at the rear of the car led to the rear of the car. The reformed Convention was held.

The mobile units produced the best efficiency figures. The former was run by Max, who could be well pleased with the result. The afternoons were conducted in the hands of Ted, who is believed to be a new convention in this event. The former was run by Max, who could be well pleased with the result. The afternoons were conducted in the hands of Ted, who is believed to be a new convention in this event. The former was run by Max, who could be well pleased with the result. The afternoons were conducted in the hands of Ted, who is believed to be a new convention in this event. The former was run by Max, who could be well pleased with the result. The afternoons were conducted in the hands of Ted, who is believed to be a new convention in this event.

Disposals chairman Keith Winders, VK2BK, as usual was the demodulator of the 809s and was even dressed for the occasion. Ross Hull Memorial VHF Contest and oth...

The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF.

There were two main events this year. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF. The Blue Mountains section conducted the Mobile Rig Efficiency VHF.

He had a good opportunity to meet the VK2 gang and brought along from this equipment these days and they surely loaded up cars with gear. Disposals chairman Keith Winders, VK2BK, as usual was the demodulator of the 809s and was even dressed for the occasion. Ross Hull Memorial VHF Contest and oth...

for the best article contributed to Amateur Radio...
W 24  PRICE £76
OUTPUT POWER: 12 watts per channel.
INPUT SENSITIVITY: Magnetic P.U. 3 mV. Tuner 45 mV.
FREQUENCY RESPONSE: 20-20,000 c.p.s. 1 dB.
FEATURES: Very compact design, ideal for "bookshelf" operation. Separate controls for each channel are linked via clutch-type main volume control.

W 45-A  PRICE £96/10/-
OUTPUT POWER: 18 watts per channel.
INPUT SENSITIVITY: Magnetic P.U. 3 mV. Tape Head 4 mV. Tuner 45 mV. Auxilliary 15 mV.

W 36  PRICE £129
OUTPUT POWER: 14 watts per channel.
INPUT SENSITIVITY: Magnetic P.U. 3 mV. Tape P.U. 36 mV. Aux. 20 mV.
FREQUENCY RESPONSE: 20-50,000 c.p.s. 0.5 dB.
FEATURES: Powerful 10 valve circuit (and one diode), and Medium, Shortwave, and F.M. radios. Tape recording and playback socket. Rumble filter, loudness control, and headphone socket.

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SOLE IMPORTERS OF TRIO AMPLIFIERS. 1660 GLEBE RD., GLEBE, N.S.W.
THOSE INITIALS—F.O.C.

ONE has, for some time, been on the lookout for a suitable term to give to the F.O.C. of the N.S.W. District. The F.O.C., as now known, was formed in the early 1930's and has grown in stature with the growth of radio. As the District has continued to develop, so has the need for a suitable term to describe the F.O.C. One answer has been offered by a number of different people at different times. The F.O.C. has always been a hard working group of members and has provided valuable service to the District.

Among the names that have been suggested, the initials F.O.C. are an obvious choice. The initials are simple and easy to remember. They are also descriptive of the F.O.C. and its activities. F.O.C. is a term that is widely used in the radio amateur community and is easily understood by most anyone who is familiar with radio. The initials F.O.C. are a fitting choice for the F.O.C. of the N.S.W. District.

The F.O.C. has always been a hard working group of members and has provided valuable service to the District. They have been active in many different areas, and have contributed to the growth and development of radio in the N.S.W. District. They have been involved in many different activities, and have been responsible for the success of many different projects.

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Radio, Television & Hobbies, March, 1962
The ‘STYLOVUE’ is a device for projecting a magnified shadow of your stylus on to a screen enabling you to see whether your stylus is worn and needs replacing, which cannot be detected by the naked eye.

Long playing records cost between £2 and £3 and when a worn stylus is used the record will be permanently damaged. With a ‘STYLOVUE’ you will detect such wear or damage before it is too late.

The ‘STYLOVUE’ can be ordered from the manufacturer for £5.25 plus 12½ per cent excise tax. Immediate delivery available for all above types.

AMATEUR TYPE CRISTAL 3.5 and 7 MC BAND

Commencing from $13/0/0 each plus 12½ per cent sales tax.

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Our crystals cover all types and frequencies in common use and include various plated and vacuum mounted. Holders include the following: DECT, E.T., E.C., M.G., V.F., C.R.A., B.T., OCTAL, HC-16U.

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Radio, Television & Hobbies, March, 1962

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WIDE BAND OSCILLATOR

3-inch £49/17/6 5-inch £55/15/-

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High Quality Transformers.

206MV and Improved frequency response. Adequate Reserve for tuner and higher fidelity. 150Ma power supply provides direct readling of Beta and I.C.O.

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Amp Units. 10 watts per channel with an input of 20mV and improved frequency response. For use with mobile equipment. £18/15/0. Post N.S.W. 5/10. 3." Latest American R.C.A. circuitry. Complete with probe.

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Stereo Recorder. £50. 50. £55/9/0. £55/17/6. £65/17/6.

7 valve 12v. 12 watt, £29/7/6

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- £3 7 6

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### ELECTRIC PUMPS

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240 A.C. POWERED
3 WATT OUTPUT
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12 CHANNEL ● LATEST PHILIPS TUNER
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Floor model Console Cabinet and Twin Cone Hi Fi Speaker £7 extra if required.
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Radio, Television & Hobbies, March, 1962
ON SHORTWAVE — By ART CUSHEN

TOP VOTE TO RADIO AUSTRALIA

In an international poll held late last year, Radio Australia was voted the most popular shortwave station for the third time, in five polls.

THE worldwide popularity of Radio Australia among shortwave listeners was again verified by the results of an international poll conducted by the International Short Wave Club of New York, Inc., and the British Broadcasting Corporation of London.

SOME of the changes made by shortwave stations in the past few months are noted in the following report:

ALBANIA INCREASES HOURS

In December, the hours of transmissions of Radio Tirana were increased from 0900 to 1800 G.M.T. Daily. In June and July of this year, however, new hours were added, so that today Radio Tirana is on the air from 0500 to 2300 G.M.T. daily.

A.G.O'S EXCLUSIVE COVERAGE

In an agreement with the Albanian Radio, R.C.W. (Radio Nederland voor de Westersprekers) has dropped its exclusive coverage of the Albanian news and has taken over the Azerbaijan service of the Azerbaijani Radio at Baku.

DZCA EXTENDS SCHEDULE

New Zealand’s Radio Kāwau, which is owned by the New Zealand Broadcasting Corporation, has extended its program schedule. The station is now on the air from 0500 to 2300 G.M.T. daily.

DENMARK'S DIFFERENTIATION

On Long Wave, Radio Denmark, which is controlled by the Danish Broadcasting Corporation, has tuned its program frequency from 5020 Kc to 5025 Kc. This was done in order to avoid interference. At the same time, new hours were added to the program schedule, so that today Radio Denmark is on the air from 0600 to 2400 G.M.T. daily.

DOMINICAN REPUBLIC'S CALL

Radio Santo Domingo, the Dominican Republic’s national radio station, has changed its call letters to WRSN. The station is now on the air from 0600 to 2400 G.M.T. daily.

HAPPY STATION

A new station has been opened in the Philippines. The station is being operated by the government of the Philippines, and it is called “Happy Station.” The station is on the air from 0500 to 2300 G.M.T. daily.

LOWU'S NEW SIGNAL

The station of Lowu, which is located in the Philippines, has changed its signal. The station is now on the air from 0500 to 2300 G.M.T. daily.

MALAYSIA'S NEW STATION

A new station has been opened in Malaysia. The station is called “Malaysia Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

OCEANIA'S NEW STATION

A new station has been opened in Oceania. The station is called “Oceania Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

PANAMA'S NEW STATION

A new station has been opened in Panama. The station is called “Panama Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

PERU'S NEW STATION

A new station has been opened in Peru. The station is called “Peru Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

PORTUGAL'S NEW STATION

A new station has been opened in Portugal. The station is called “Portugal Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

RUSSIA'S NEW STATION

A new station has been opened in Russia. The station is called “Russia Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

SOUTH AFRICA'S NEW STATION

A new station has been opened in South Africa. The station is called “South Africa Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

THAILAND'S NEW STATION

A new station has been opened in Thailand. The station is called “Thailand Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.

TURKEY'S NEW STATION

A new station has been opened in Turkey. The station is called “Turkey Radio.” The station is on the air from 0600 to 2400 G.M.T. daily.
TELECOMPONENTS

TRANSMITTING BALUNS
144 Mc/s 30 Watts Type No. 5500.
Now available at stock. Exclusive Radio, TV & Hobbies price, direct from manufacturer. Fully encapsulated in weatherproof epoxy resin with small coaxial connector and 50 Ohm feeder attached £3/6.

SPECIAL RELEASES—LESS THAN HALF-PRICE
Type No. 9200 Miniature 1W Transformer 455 Kc in fin square bled can Universal Type — suits all receivers — delivered .... 76
6in Speakers 3 Ohm Voice coil. delivered .... 288

VARIABLE CONDENSERS—SPECIAL OFFER
Roblan or M.S.P. 3 gang, delivered 180
M.S.P. 2 gang, delivered 125

POTENTIOMETERS and OTHER COMPONENTS
0.5 meg. ohm with switch M99 ea. 48
50k ohm, no switch ea. 28
Switches AX2809, Walfar 25
Oak Vibrators V5157 23
Condenser Mica 50 pf ea. 2.
Condenser Mica 82pf ea. 2
Condenser Electrolytic 0.1uf ea. 1
Condenser Electrolytic 0.5uf ea. 1
Condenser Ceramic 68pf 1KV ea. 2
Condenser Ceramic 185pf 350v ea. 2
Condenser Ceramic 1800pf 1.5KV ea. 2
6 Volt Diverter Units, complete ea. 90

COMPACT SIX BAND SERVICE OSC.
September issue, 1960.
3of 6 Coils, Bands A to F, each .... 72
Line Filter Chokes, each .... 86
Audio, Freq. Osc. Transformer, each .... 176
Power Transformer .... 376
Including Tax and Postage.

The Popular Mullard 5 Transistor Cordless Mantel 604R
Radio, TV and Hobbies, Oct. 61.

Type No. Full Price
7105 Aerial loopwick 8 x 3/in rod .... 18
7309 9mc Coil, Duplo pot. .... 9
9101 455 Kc. I.F. Duplo pot .... 8
9108 455 Kc. I.F. 37A Duplo pot .... 8
9109 455 Kc. I.P T4 Duplo Pot .... 8
5203 Driver Transformer .... 28
4106 Unstamped Transformer .... 21

COMPLETE COIL and TRANSFORMER KIT £3/16.
Radio, TV and Hobbies Three Band 8 Transistor Receiver.
For long distance reception. Full price for all coils and transformers (delivered). Broadcast only. £5 8 0
1 Band Set .... £3 0 0
Kit contains all coils, ferrite rod or aerial coil, I.F.s and Audio Transformers. (When ordering, please specify aerial coil or ferrite loopstick.) All components are fully tested to specifications, exactly as supplied for the original receiver.

Alternatively, items may be purchased singly

Type No. Full Price
718 Tuned ferrite aerial coil (optional) .... 17
719 High Gain Aerial Coil .... 17
719 Oscillator Coil .... 9
719 R.F. Coil .... 16
919 455 Kc. I.F. Transformer double tuned, each .... 16
524B Driver Transformer .... 17
4102 Output Transformer for 3 Ohm, Voice Coil, each .... 17

ADDITIONAL COILS FOR SHORT WAVE
S.W. Aerial Coil 2-18 mc No. 7420 .... 2
S.W. R.F. Coil 2-18 mc No. 7502 .... 2
S.W. Oscillator Coil 2-18 mc No. 7621 .... 2

(please state frequency range when ordering.)

NOTHING EXTRA TO PAY...TAX INCLUDED

752 PITTWATER ROAD, BROOKVALE, N.S.W. TELEPHONE XF0221
(A DIVISION OF FERRIS INDUSTRIES LIMITED)
from 1920 to 1935, using 6010, 9575 and 11710 Kc. From Monday to Friday, they are carried by Rome Radio, which broadcasts United Nations programs in Arabic on the air at 11975 Kc. Transmission power was formerly 4780 Kc, but has been noted in Finland with news items in this frequency in French at 1115 hours GMT, and this is a new test frequency. The station uses 4972 Kc for its news broadcast in English and Tagalog, and includes popular light music at 1730 hours GMT. Monday to Friday, these programs are offered listeners a means of verifying this Central American country.

The station has been irregular in its operation, but is again using this frequency at a time to be announced. The latest schedule is expected to be as follows: Monday 1500 to 1830, and 2300 to 0205, and all the broadcast has been heard after 0600. YSS, 70, 175, 200, 300 and 500 W are used. The powers of the transmitters are 5 Kw and 500 watts. Verification from the station has been heard from 0700 to 0800 Q.M.T., 9645, 11910, 17750, 21590 Kc. Transmission power was formerly 855 Kc. The powers of the transmitters are 8 Kw.

Note, from reader, AouM be wot to AR-10. It is now carried on shortwave frequencies at various times. The whole program is in Urdu, and heard in North America with its test transmissions on 15390 Kc. For this test broadcast, the signals are excellent. Some attempt to answer the Cuban signals, which are received here after 0600. YSS, 70, 175, 200, 300 and 500 W are used. The powers of the transmitters are 5 Kw and 500 watts. Verification from the station has been heard from 0700 to 0800 Q.M.T., 9645, 11910, 17750, 21590 Kc. Transmission power was formerly 855 Kc. The powers of the transmitters are 8 Kw.

The station has been heard at the same time as a Cam-eroon station at DJuboutl, using 5000 watts. The signal has been noted in France with news items in this frequency in English and Tagalog, and includes popular light music at 1730 hours GMT. Monday to Friday, these programs are offered listeners a means of verifying this Central African country.
TECHNICAL DETAILS
FREQ. RANGE 50 to 17,000 CPS
OUTPUT—50th Ohm 1 volt/dyne/eq
IMPEEDANCE 50 ohms
FINISH Grey and Satin chrome
SIZE: 1 inch Front G.D. to
1/2 inch Rear G.D.
CONNECTOR, Locking 3 pin Canon
SWIVEL 3/8 inch to 20 T.P.I.
1/2 inch slotted clamp.

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58 HIGH STREET, GLEN IRIS, S.E.6, VICTORIA
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7 x 40 GENUINE OTWAY
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Our price £4/18/6

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ALL LENSES
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30 Power Coated Lens,
Brand new, £9/6

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Tripod.
£10

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It. x. 30 for marine, football
Competitions & use for a 30
D.C. range around 30 yards
£6/15/0

SPECIAL QUALITY TOOL OFFER
1 Set 6 SAE Set Spanners, sizes 1/8 to 1
In.; 1 Set 6 WHIT. Set Spanners, 1/8
(0 9/16In.; 1 Ring Spanner, 5/8
x 11/16In.; 1 Open End Ring Spanner, 11/16
x 13/16In.; 1 Tube Spanner, 14 MM x 18 MM.; One 6in. Shifting Spanner; 3 BALL PEIN Hammers, 8oz., 16oz., 24oz., 1
1/2in. Screw Driver; 1 pair 6in. PLIERS; One 15
ft. TOW ROPE with spliced loop and steel hook; 1 METAL TOOL
BOX, 19in. x 18in. x 71in.
The Lot for £6/15/6

SPECIAL QUALITY TOOL OFFER
1 lot 6 SAE Set Spanners, sizes 1/8 to 1
In.; 1 Set 6 WHIT. Set Spanners, 1/8
(0 9/16In.; 1 Ring Spanner, 5/8
x 11/16In.; 1 Open End Ring Spanner, 11/16
x 13/16In.; 1 Tube Spanner, 14 MM x 18 MM.; One 6in. Shifting Spanner; 3 BALL PEIN Hammers, 8oz., 16oz., 24oz., 1
1/2in. Screw Driver; 1 pair 6in. PLIERS; One 15
ft. TOW ROPE with spliced loop and steel hook; 1 METAL TOOL
BOX, 19in. x 18in. x 71in.
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Ideal for fencing, aerial cables,
etc. Suitable for wire up to 5/16
In., £7/6.0 per set.

WIRE STRAINERS
£1/15/0

106 Radio, Television & Hobbies, March, 1962
FULL OF ODDMENTS INTO DISCRETE LOTS, THEY WOULD NO LONGER BE ABLE TO SELL THEM

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THE CONTROL UNIT IS LIKELY TO APPEAR IN THE...

...too much for the advanced amateur re-

...than we had anticipated, two or three readers suggesting that we had been

...bargains.

...defer plans until the situation improves.

...remote control system for models, we

...and will have to

...to the type of meter used.

...of members suffering, however, and will con-

...the ruling price and they would cease to be "bargains."

...his name. He comments on a recent paragraph in these columns "A Legiti-

...for a mixed array of resistors and capacitors. Though a few appeared not to

...Playmaster Unit, but incorporating

...high-gain stereo control unit, June, 1959.

...to build one channel of our high-

...flash tubes and reflector as-

...promising may show up soon. However,

...units, G.C., and feel that something

...look at transistorised electronic flash

...limit to what can be said in a given

...practically worthless components of the maga-

...the nature of beginner's mistakes. Finally, he

...ready to you. Would you kindly write

...we in the January

...of names suffering will be better than none at all. Please note that

...to articles published in the magazine. As a rule, requests for circuits will be answered more

...rent values is that considerable variation

...would consider publishing details of a

...at transistorised circuitry, because it was

...the switched tone control system is some-

...its Technical section has not been answered by telephone.

ANSWERS TO CORRESPONDENTS

WELL SATISFIED WITH PURCHASE

"Reader" (Como, W.A.) states that his letter personally but requests that we with-

...for a mixed array of resistors and capacitors.

...to have come from the source quoted, and he received—well over the advertised total number of 100.

...ordinarily neglecting the beginner.

...ments limit the space available for

...essential. Now there is, of course, the

...aiming to give a mixed array of resis-

...insofar as can be drawn from general knowledge of the relevant subject. We cannot provide

...particular paragraph ceased more com-

...more specialised circuit.

...because we feel that voltages and currents are approxi-

...of other features, from time to time, to

...would have space for.

...as a regular (and perhaps better) way of answering all our correspon-

...a 6in x 5in glossy print; postage 9d extra. Apan from complicated projects like TV sets and oscilloscopes, most

...no details of wiring, etc. Apart from complicated projects like TV sets and oscilloscopes, most

...to the type of meter used.

...unnecessary worry for some readers. We

...of names suffering will be better than none at all. Please note that

...in the January

...of our published circuits. Answers will be given in note form and only

...directly to articles published in the magazine. As a rule, requests for circuits will be answered more

...or discussion of commercial designs or special circuits.

...related to the technical query service.

...technical queries are not answered by telephone.

RADIO, TELEVISION AND Hobbies QuERTSr

"To assist our readers, "radio. television and Hobbies" conducts a technical query service.

...queries are not answered by telephone.

...to the type of meter used.

...of names suffering will be better than none at all. Please note that

...aiming to give a mixed array of resis-

...more specialised circuit.

...because we feel that voltages and currents are approxi-

...nest values is that considerable variation

...rent values is that considerable variation

...the magazine. As a rule, requests for circuits will be answered more

...particular paragraph ceased more com-

...more specialised circuit.

...because we feel that voltages and currents are approxi-

...nest values is that considerable variation

...rent values is that considerable variation

...the switched tone control system is some-

...its Technical section has not been answered by telephone.

...more specialised circuit.

...because we feel that voltages and currents are approxi-

...nest values is that considerable variation

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...nest values is that considerable variation

...rent values is that considerable variation

...the switched tone control system is some-

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Address ______________________________
State _________________________________

Revie, Television & Hobbies, March, 1962
mechanically to a gripping mechanism on the guide rails which grinds the car. If for any reason the car attempts to stop above or below a floor, it becomes excessively a slip mechanism on the governor then switches off the driving motor.

This is unavoidable in order to apply the ordinary brake on the wheels. If this is not effective a slightly greater increase of speed causes the governor rope to activate the gripping mechanism under the car. This brings the lift to a smooth standstill.

**BOTTOM SUFFERS**

Then there are the buffers at the bottom of the well which buffer the shock if the car overshoots the bottom floor, which are mounted in an arrangement according to the type of lift.

Other safety devices are fitted to the door mechanisms, of which there are two, and two mechanical on each door. The baywindow door cannot be opened unless the lift car is at the floor. The opening of the lift door automatically opens the bay door.

The latest type of door protecting mechanism makes use of an electronic device, part of which is enclosed in the edge of the door. This is in the form of an annulus, connected through an electrostatic amplifier and relay. The relay operates the motor which opens and closes the doors. When no object such as a hand or fingers enters within a few inches of the edge of the door the capacitance changes. Sensors current will flow and reverse the door opening or closing action only a few inches of the door. Without touching the passenger's body, to an electronic oscillator which is self programing. A further door protecting device makes use of an inductance photo-electric cell which sends no description.

**SPECIAL "BUTTON"**

A new type of touch button for floor selection is also an electronic device. Inside the plastic illuminated frame with an on-off switch, to an amplifier and relay, the relay operates the motor which opens the doors. Within a few inches of the edge of the door a capacitance changes which is detected by a sensor system which sends a signal to the motor. The door opens and closes when the sensor has been touched.

Another door protecting device makes use of an inductive proximity device which sends no description.

When conditions are normal the lifts will run to this program, but if conditions become abnormal for any reason, the computer will detect if and after the running of any lift will reset the new conditions.

For instance, assume that traffic becomes abnormally heavy on a floor which is usually fairly light. One or two cars may be programmed to serve this floor. The computer will detect the new conditions, probably by the increase of button pressing, and cause an extra lift to stop at that floor until conditions return to normal.

Devices can also detect when a passenger or passengers have been waiting an abnormally long time for a lift, made by the computer to serve as a field around the vicinity of the lift. The computer will not arrange a lift program accordingly. In short, the computer program the operation of a group of lifts by analyzing the traffic pattern.

A typical installation is the One Ele- vator variety recently installed in the new A.M.P. Building at 440 George Street, Sydney. It consists of seven modern automatic lifts which travel at 1,000 feet per minute. As a slight indication of the complexity of a modern lift system, the electric wiring in this system used 228,000 yards of wire.

Similarly, a visit to a modern lift company's works discloses a remarkable array of desks where electrical, mechanical, and electronic draughtsmen are totally automatic in the sense that they are programmed to serve this floor. They do not operate, others stop at only some floors. During peak hours certain lifts are ex- pected to find the top and lower floors, and so on.

While conditions are normal the lifts will run to this program, but if conditions become abnormal for any reason, the computer will detect if and after the running of any lift will reset the new conditions.

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**C E R T I F I C A T E**

**L A U R A Y O V N C**

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Printed Circuits. Expert km and made circuits, 35/-
Radio, Television and Hobbies, March, 1962

ALWAYS RELY ON R.B.S.
Philips sought the best means of producing the world’s fastest heating electron tube. Found it in the Harp Cathode. As developed by Philips, Harp Cathode tubes permit warm-up in as little as 0.001 second. This major advantage, combined with low cathode inductance, low operating voltage and extreme ruggedness, make Harp Cathode tubes the logical choice for transportation mobile and airborne communications, and any other application where instantaneous response is a necessity.

Described simply, the Harp Cathode is a flat rectangle, strung harp-fashion with many superfine wires. Its unique advantages are largely a function of this physical arrangement. Thus, the minute wire size provides a high surface-to-volume ratio, resulting in instantaneous availability of thermal energy at the emissive surface. The quantity of electrically parallel, directly heated wires assures low cathode inductance. The low (1.6 V.) filament voltage affords the closest approach to the “unipotential” cathode. Moreover, in actual tests, tubes incorporating the Harp Cathode have given longer service life than tubes with conventional cathodes.

The Philips Harp Cathode, Type 8042/QC05/35 RF Power Amplifier (25 watts diss., 175 mc.), and QQC03/14 (12 watts diss., 300 mc.) are available. They are the forerunners of an entire family of Philips fast-heating Harp Cathode power tubes, which will include fast-heating versions of the Type 6939/QQE02/5 miniature twin tetrode (7.5 W., 500 mc.); and the 6907 double tetrode (15 W., 450 mc.).

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