

# Construction Continued

## FACTS ABOUT CONDENSORS

(Continued from Page 12.)

inductance of the aerial circuit is increased, with a resultant increase in the wavelength of the aerial. If you lengthen the wires forming your aerial without increasing their number, you are increasing the total inductance of the aerial. It is obviously impracticable to be continually altering your aerial each time that you wish to increase or decrease the wavelength to which your aerial is to be tuned. To enable you to effect this altering of wavelength your inductance and condenser are inserted into the circuit.

To alter the tuning of the receiving instrument you vary the inductance and capacity of the circuit by varying the adjustment of your variable inductor, or variable condenser. In the same way you alter the position of the weight of a pendulum to regulate the rate at which the pendulum shall swing, and thus to control the clock.

Thus you will see that inductance and capacity may be said to be the electrical counterparts of inertia and elasticity.

## DISTORTED RECEPTIONS

(Continued from Page 12.)

better results, and it is no small problem to produce good quality and good volume at the same time, but it can be done. The writer's standard receiver has just been rebuilt on a different plan, and although the change did not affect the audio amplifier, there is a marked improvement in tone in the ordinary four-valve circuit.

And here the writer would like to say that his remarks in this column at different times with regard to good radio reproduction are all intended to be in a helpful spirit. Radio is developing rapidly, and ideas change quickly; hints given to-day may not be in entire agreement with those given at a much earlier date.

Some listeners suffering from distorted reception would like to see the transmitting station bear the blame, but nobody has yet advanced any tangible proof that the station (particularly referring to 2YA) is to blame. The writer hears almost every afternoon and evening session, and has a good opportunity of judging quality, and finds it consistently good so far as transmission is concerned. Bad transmission may be almost as readily detected at close quarters as at a distance. The writer, moreover, is no "servant of the company," and is just as interested as any other listener in making complaints of any shortcomings.

It is probable that in most districts from which complaints of distortion emanate listeners could be found who get fairly consistent good reception. Even one such case in a district would prove that the distortion was locally produced.

## GOOD RECEIVERS OR COMPONENTS

FINANCIAL considerations, unfortunately, have a close relation with good reception, and in the radio business the article at double the price will usually give double the satisfaction, just as in most other lines of business. If you are a constructor, it is an easy matter to keep testing improvements in the set, but if you are buying a ready-made set for entertainment it pays to get as good a one as you can afford, and to take careful note of the tone and volume it will give.

## GETTING THE DEEP NOTES.

DEEP musical notes are a severe test for any receiver and loudspeaker, and a combination that handles all deep notes without distortion, and does not lose or unduly weaken the high notes, is worth possessing.

Poor, undersized audio transformers and unsuitable horn loudspeakers are the cause of more distortion than anything else, for they will give distortion when there is no interference. The only way to get good reproduction from such a combination is to cut down volume to a reasonable level. The better the set the more volume it will give without losing quality of tone. The humble crystal is a quality-giver, and only when we add valve amplification with unsuitable components does its quality begin to suffer so far as the action of the receiver itself is concerned. If good quality and volume are desired from amplification of crystal reception, then the amplifier must be of just as good a calibre as if intended for the amplifier of a valve set. But a good valve set, properly handled, is capable of giving just as good reception as any crystal receiver, although the latter, without amplification, reproduces the lowest musical notes put over by the station.

In order to test what notes the valve outfit, which includes the loudspeaker, is reproducing, every multi-valve operator-experimenter within crystal range of a station is recommended to fix up a crystal receiver and listen-in with the 'phones. In many cases there will be heard by means of the crystal the low strumming notes in the bass that are, perhaps, entirely absent or blurred beyond recognition in the loudspeaker reproduction. Constructors may, therefore, set the crystal reception as a standard to work by, and gradually improve their receivers until they will, in combination with the loudspeaker, reproduce all the notes heard through the crystal.

One easy method that has already been recommended for improving the first audio stage is by substituting for the transformer a resistance unit such as the Philips or similar ones that are on the market. These are simply connected up just in the same way as a new transformer would be. But there are other considerations. One point is that the detector valve must now be one of high impedance and amplification to work in conjunction with the resistance coupling. Another point is that as resistance coupling gives greater prominence to the deep notes, the audio gear following must be capable of handling such notes. This responsibility falls chiefly upon the second transformer, which must be a thoroughly good last stage model with high impedance primary winding, and upon the last valve, which should be of not more than, say, 5000 ohms impedance in order to be capable of handling the required volume without distortion. Having now reached the output terminals of the set, we have the loudspeaker to deal with. Quite likely this is a horn type, and if it is capable of properly handling low notes it is something out of the ordinary. Most horn speakers tend to make "mush" of all notes below a certain pitch, or frequency, and to a certain extent, the lower that pitch the better the speaker. But a good cone speaker reproduces low notes with ease, though it may tend to weaken the very high frequencies to some extent, but as most of the distortion arises on the low notes, it is cutting out a lot of trouble to have a speaker that will handle them. Balanced or double action in a cone speaker makes for quality and even reproduction, as also does one with elastic attachment round the edges of the diaphragm rather than one with rigid fixing, though this does not apply in every case.

## ONCE AGAIN THE OUTPUT FILTER.

NOW, the windings upon the magnets consist of a large number of turns of very fine wire, so fine that it will only carry a very limited amount of current. But when a power-valve is employed in the last stage, a very considerable amount of current may be passing from the B battery through the valve and speaker windings, and this current may be so great as to cause the

loudspeaker, whether horn or cone, to work inefficiently, owing to the comparatively large amount of direct battery current, having a detrimental action (saturation) upon the magnets. When this battery current passes through the valve it has indirectly impressed upon it by the grid what are called voltage impulses or fluctuations of an alternating character, and it is these impulses that really actuate the speaker. It has been found that after the battery current has passed through the valve it may be diverted directly back to the battery, leaving the voltage impulses alone to traverse the speaker windings, still transmitting the same amount of power to the diaphragm, with improved quality, owing to the reduced strain upon the windings.

This separation of the alternating and direct currents is accomplished by what is usually referred to as an "output filter," and is a combination of two components, firstly, a choke coil, which has the property of passing direct current but not alternating current, and, secondly, a fixed condenser of large capacity (2 microfarads), which has the property of passing the alternating impulses and not the direct current. These are connected up in a way that has frequently been dealt with in these columns. The use of such a filter will allow of the speaker carrying greater volume owing to the carrying capacity of the windings having been relieved of the unnecessary direct current. Such filters may be purchased as a complete small unit ready for attachment to the output terminals and speaker. For an output equal to or over 90 volts at 10 milliamperes, it is a necessity for good reproduction, and also protects the speaker windings from damage, and does away with the necessity for connecting the speaker or 'phones according to polarity (positive and negative) of the leads.

The above are some of the main points in audio improvement for better reception. Such improvements should always be made with the fact in mind that one improvement leads to another—that greater volume or deeper notes passed on by one component must be retained by improving the components that follow, so that they may efficiently handle the increase.

## WATCH DETECTOR VOLTAGES.

MENTION should also be made here of the amount of distortion that can be produced by pushing the detector too hard, that is, attempting to get too much amplification from it. Both filament and high-tension voltages should be kept down rather than pushed to the maximum, and tone will be helped thereby, and speech clarified. Note how the s's and t's come through your loudspeaker. They are sometimes almost lost in an unsatisfactory audio system.

An appeal is made to all operators of receivers to do all in their power to prevent their sets from causing interference, however slight, for the multiplication of slight effects is serious, and the more aggravated cases of howling are most certainly a direct preventive of a certain number of people becoming listeners. Operators may scarcely realise that by keeping the ether clear they may do a great deal to assist in attracting additional licensees to provide the money for the improved programmes, which are so frequently asked for.

## RESISTANCES IN SUPPLY

QUITE recently a paragraph was reprinted from an American journal giving a method of giving equal drain over the whole of the cells of a B accumulator by treating the total voltage as the output of a B eliminator and by means of variable resistances cutting down the voltage to suit the several valves. A correspondent figured the matter out, and sent his view of the question, showing that the consumption of current would be greater than by the tapping system, as the drain over the whole battery would be equal to that of the total of all the valves. This is quite correct, and at first sight the idea appears to be uneconomical. But we must not lose sight of the purpose of the proposed idea—the equal use of all the cells in the battery.

Under the tapping system the higher voltage cells are putting out less current, as they are supplying fewer valves, and so, in order to fully charge the latter, the former always receive a considerable overcharge, and this is what it is sought to avoid. By adopting the B eliminator system of control, we dissipate in the resistances the power that would otherwise be expended in overcharge, causing a certain amount of deterioration of the overcharged cells, and the battery is charged up in the usual time, no part being obliged to receive an overcharge as formerly.

In the issues of September 30 and October 7 last, "Megohm" described a method of charging a 112-volt accumulator at low voltage by connecting the rows of cells in parallel by the substitution of a "parallel" connector in place of the "series" connector. In the original battery the unequal use of cells was provided for by the use of a "reverse" connector, which, when substituted by the "series" connector, had the same effect as if four rows of high voltage cells were lifted over and used for low voltage, the low voltage being used as high. This connector was not described, as it was considered that many constructors would consider it "too complicated." But all the same, the battery is most convenient when constructed with the switching arrangement, as by merely changing the connecting-piece the battery is charged by an A battery charger, giving 16 to 20 volts and instantly connected in "series" or "reverse" at will.

An alternative set of figures is marked under the tapping sockets for use when in "reverse." Any constructor writing in will be supplied with a diagram of this connector.

## AUSTRALIAN PROGRAMMES

### 2FC, SYDNEY

(442 metres.)

### WEDNESDAY, APRIL 18.

8 p.m.: "Big Ben"; from the Capitol Theatre, Sydney, the Capitol Symphony Orchestra, of 30 members; items on the Wurliitzer organ, played by Mr. Fred Scholl; Ted Henkel and his stage band of 20 players; vocal quartet, in association with the stage prologue. 8.45: From the studio, Mabel Batchelor (soprano) and Eileen Boyd (contralto), duets (a) "Tales of Hoffmann" (Offenbach), (b) "By-Bye Babe" (Vera Barnett) (accompanied by the composer). 8.55: Gladstone Bell, cello solos. 9: "Big Ben"; late weather forecast. 9.15: Will Bowyer, basso, (a) "The Admiral's Yarn" (Kubens), (b) "The Swordsman" (Wallace). 9.8: From the Capitol Theatre, Sydney, the Capitol Symphony Orchestra; at the Wurliitzer organ, Mr. Fred Scholl. 9.25: From the studio, Mabel Batchelor (soprano) and Eileen Boyd (contralto), duets, "Venetian Boat Song" (Blumenthal), "Just You and Me" (Barnett) (accompanied by the composer). 9.35: Gladstone Bell, cello solos. 9.42: William Bowyer, basso, (a) "Wander Thirst" (Ronald), (b) "Drake's Spirit" (Stewart). 8.48: H. W. Varna and company will produce the play "Sherlock Holmes" (by arrangement with J. C. Williamson, Ltd.). Characters: Sherlock Holmes, H. W. Varna; Dr. Watson, William Hume; Norman Holmes, Alan Arthur; Fisher, Lady Edward Leighton; Muriel Conner, Count Stalburg; E. H. Brewer; Professor Moriarty, Foster Dean; Jim Larrabee, Noel Robertson; Billy, Somerset Varna; Madge Larrabee, Cleo Glover; Alice Faulkner, Felix Clark. "Sherlock Holmes," part one—Scene: Sherlock Holmes' room at Baker Street. 10.12: Incident music to part two. 10.14: "Sherlock Holmes," part two, played by H. W. Varna and company. Scene: The Gas Chamber at Stepney. 10.36: Late weather forecast; incidental music to part three of "Sherlock Holmes." 10.38: "Sherlock Holmes," part two, played by H. W. Varna and company. Scene: Dr. Watson's house, Kensington. 10.58: Tomorrow's programme and late news. 11: "Big Ben"; National Anthem; close down.

### THURSDAY, APRIL 19.

8 p.m.: "Big Ben"; the 2FC Orchestra, conducted by Horace Keats. 8.15: Peter Gawthorne, baritone. 8.25: Henry Penn, pianoforte solos, (a) "Romance" (Grünfeld), (b) "Lullies of the Valley" (Poldini). (c) "Country Gardens" (Grainger). 8.35: Madame Vera Tasma, soprano (with or without orchestral accompaniment). 8.43: The 2FC Studio Orchestra (conductor, Horace Keats). 8.55: Ernest McKinlay, tenor, (a) "A Futile Effort" (Gordon), (b) "Eleanore" (Mallinson). 9: "Big Ben"; late weather forecast. 9.1: James Pheloung, cornet solo. 9.5: Peter Gawthorne, baritone. 9.15: Concerto for piano and orchestra, "Capriccio Brillant," Op. 28 (Mendelssohn); at the piano, Henri Penn, and 2FC Orchestra, conducted by Horace Keats. 9.28: Madame Vera Tasma, soprano. 9.35: Charles Lawrence and Len Maurice, duets. 9.46: The 2FC Studio Orchestra (conductor, Horace Keats). 10: "Big Ben"; Ernest McKinlay, tenor. 10.8: James Pheloung, cornet solo. 10.15: Charles Lawrence and Len Maurice, duets. 10.25: The Ambassadors' Dance Orchestra (conductor, Al Hammett). 10.35: From the studio, late weather forecast. 10.37: The Ambassadors' Dance Orchestra (conductor, Al Hammett). 10.57: From the studio, tomorrow's programme and late news. 11: "Big Ben"; the Ambassadors' Dance Orchestra. 11.45: National Anthem; close down.

### FRIDAY, APRIL 20.

8 p.m.: "Big Ben"; Alexander Sverjensky, pianoforte solos, (a) "Prelude in A Flat Major" (Chopin), (b) "Prelude in B Major" (Chopin), (c) "Valse in C Sharp Minor" (Chopin). 8.12: Sydney Calland, baritone. 8.20: The "Smart Set" Instrumental Trio (leader, Molly Gant). 8.32: "Tune in and listen." 8.45: Alexander Sverjensky, pianoforte solos, (a) "Etude of Petrarca" (Liszt), (b) "Impromptu" (McDowell). 8.55: Sydney Calland, baritone. 9.3: Late weather forecast. 9.4: The "Smart Set" Instrumental Trio (leader, Molly Gant). 9.5: Rev. F. H. Raward's talk, "Let's Go Round the World." 9.30: "Tune in and listen." 9.40: The "Smart Set" Instrumental Trio (leader, Molly Gant). 9.50: From Her Majesty's Theatre.

Sydney, the second act of the musical play "Rose Marie," featuring Harriett Bennett and Frederick Bentley. Musical numbers: Opening chorus; trio, "Only a Kiss," Frederick Bentley, Yvonne Banvard, and James Hughes; sextette, "Finale," Harriett Bennett, Reginald Dandy, Noel Allan, Lou Vernon, Mabel Lambeth, and Stephanie Deste; Empire march and gallop, song and dance, "Minuet of the Minute," Harriett Bennett, Frederick Bentley, and Stephanie Deste; dance, "Wanda Waltz," Stephanie Deste, (a) Bridal Procession, (b) song, "Door of My Dreams," Harriett Bennett and chorus; bridal finale; finale ultimo. Scene—1: A novelty shop in Quebec. 2: Grand Ballroom, Chateau Fontenac, Quebec. 3: Impression, the cellar of a hotel, on the river-front, Quebec. 4: On a hill near Kootenay Pass. 5: The Casino. 10.57: From the studio, tomorrow's programme and late news. 11: "Big Ben"; the Ambassadors' Dance Orchestra. 11.45: National Anthem; close down.

### SATURDAY, APRIL 21.

8 p.m.: "Big Ben"; from the Prince Edward Theatre, Sydney. (1) Introductory music by Prince Edward Concert Orchestra, conducted by Albert Cazaban; (2) incidental music to "Solitudes," a fox-trot subject; (3) Eddie Horton, world-famed organist, at the Wurliitzer organ, in special novelty numbers; (4) incidental music to the cartoon, "Rail Road"; (5) violin solos by Albert Cazaban (accompanist, Paul Vinogradoff); (6) incidental music to the picture, "Find the King"; (7) Albert Cazaban and concert orchestra in "Operatic Gems"; vocalists, Molly de Gume (soprano), Ansurin J. Moore (tenor), Lionel Lunt (baritone). 9.3: From the studio, late weather forecast. 9.6: Cyril Monk, violinist. 9.14: Norman Francis, tenor. 9.21: Alexander Sverjensky, pianoforte solos, (a) "Prelude in A Flat Major" (Chopin), (b) "Prelude in B Major" (Chopin), (c) "Valse in C Sharp Minor" (Chopin). 9.31: Frank Chapman, comedian. 9.38: Cyril Monk, violinist. 9.46: Norman Francis tenor. 9.54: Brunton Gibb, entertainer. 10.2: Frank Chapman, comedian. 10.10: Alexander Sverjensky, pianoforte solos, (a) "Sonnet of Petrarca" (Liszt), (b) "Impromptu" (McDowell), (c) "Dance Rustique" (Boscoff). 10.20: Brunton Gibb, entertainer. 10.30: Late weather forecast. 10.31: Harrison White, banjo solos. 10.38: From the Ambassadors' Dance Orchestra. 10.54: Brunton Gibb, entertainer. 10.57: From the studio, late weather forecast. 10.57: Tomorrow's programme and late news. 11: "Big Ben"; the Ambassadors' Dance Orchestra, in popular numbers until 11.45 p.m. 11.45: National Anthem; close down.

## RADIO IN U.S.A.

Listeners in America have troubles which listeners in New Zealand do not have.

At the present time there is considerable uproar in the United States regarding broadcast regulation. The country was divided into five districts by the Radio Act of 1927 and a great proportion of the total watts power of the United States is concentrated in the most populous districts, that is, in New York and Chicago. The southern States have complained about discrimination, although the shortage of power in their areas is due to the lack of initiative in erecting stations. In the meanwhile, the broadcast band has been filled with stations and any power increases in the south are difficult to accommodate.

To counteract this situation, a Bill is proposed which will require the Federal Radio Commission to equalise the power distribution in the five districts. To comply with this mandate, it would be necessary to curtail the power of stations in the New York area by eighty per cent.

## SCREEN-GRID VALVES.

INQUIRY shows that a good stock of these valves is held in Wellington. The first shipment of Marconi 5625 screen-grid valves is not expected to arrive for some time.

## An Old-fashioned CHALLENGE to Combat



Time and again, Zenith has published this unwavering challenge to the world of radio:

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