

- 9.44: Bass—Mr. W. J. Richards, with orchestral accompaniment, "King Charles" (M. V. White).  
 9.48: Male quartets—The New Lyric Four, negro spiritual, (a) "Steal Away to Jesus" (Tradl.); (b) part song, "Lullaby" (Brahms).  
 9.52: Selection—Creator's Band, "Aida," Act 2 (Verdi): (a) "Introduction and Moorish Ballet," (b) "Grand March and Finale" (H.M.V.).  
 10.0: God save the King.

#### 4YA, DUNEDIN (650 KILOCYCLES)—SUNDAY, AUGUST 2.

- 3.0: Selected recordings.  
 5.30: Children's Song Service, conducted by Big Brother Bill.  
 6.15: Selected recordings.  
 6.30: Relay of Evening Service from Knox Presbyterian Church. Preacher, Rev. D. C. Herron, M.A. Choirmaster, Mr. C. Roy Spackman.  
 7.45: Selected recordings.  
 8.15: Relay of concert programme from 3YA, Christchurch.  
 10.0: God save the King.

#### 2YB, NEW PLYMOUTH (1230 KILOCYCLES)—SUNDAY, AUGUST 2.

- 6.0 to 6.45: Children's Sunday Service.  
 8.15 to 10.0 p.m.: Concert programme.

## Programme Features

(Continued from page 19.)

### Christchurch Notes

THE "Radio Service" dialogues by Messrs. Cosgrove and W. Melbourne will be continued this evening. Miss Anita Ledsham will contribute four popular songs: "Buy My Strawberries," "Irish Folk Song," "Come, Lads and Lasses" and "The Bonny Banks of Loch Lomond," while Mr. L. T. J. Ryan will entertain for fifteen minutes with "Tricks and Teasers," a radio conjuring turn. Saxophone and piano novelty items will be played by Mr. Lyndon P. Christie and Miss Clive Winston. The instrumental portion of the concert will be provided by the Studio Octet, under Mr. Harold Beck.

### Dunedin Features

UNDER the auspices of the Department of Health, a talk will be broadcast at 7.40 p.m. Some very fine quartets will be sung by the Select Four in the evening.

## SATURDAY

### Auckland Notes

THE second series of radio talks, under the auspices of the N.Z.A.R. Transmitters' Association, will be given at 7.40 p.m. by Mr. J. R. Turnbull, of ZLIB1, on "Valves and Their Uses." There will be a miscellaneous week-end concert from 1YA. Mr. J. A. Shanks, baritone, who made a splendid impression on his first appearance at this station, will be singing, and Miss Joyce Hould, the well-known elocutionist, will be heard in two humorous numbers. A new artist to perform will be Mrs. G. T. Brian, a very versatile lady, who is giving several songs at the piano. The Orchestral Octet will be heard in numbers which are sure to be popular.

### Wellington Features

A TALK on "Gardening" will be given by Mr. W. M. Jackson at 7.40. A programme will be presented from the studio at 8 o'clock. The Salon Orchestra, under Mr. M. T. Dixon, will play the overture "Vienna Echoes," arranged by Tobani, the suite "My Lady Dragonfly" by Finck, while Mr. W. Haydock will play a violin solo with orchestral accompaniment, "Melodie,"

by Tchaikowsky. The orchestra will be heard in a novelty number for piano and strings, "Folk Tunes and Fiddle Dance" by Fletcher, "Three Dances" from "Hullo America," by Finck, and the latest dance novelties.

A feature of the programme will be the Bridges' Trio, a combination of clever young players from Wanganui. They are experts on xylophone and guitars, and have appeared before the microphone at all the leading broadcasting stations in Australasia. They will be heard in the selections "La Paloma" and "Lebenslust," played as xylophone trios, and "Moonlight on the Colorado" and "Roca Ra," as guitar duos, with piano accompaniment.

Mr. Walter Brough, baritone, a well-known and popular singer from 1YA, will make his first appearance at 2YA. Miss Florence Penney, L.A.B., will feature popular songs at the piano.

### Dunedin Notes

"OUT in the Open" will be the title of a talk to be given by Mr. P. L. Ritchie, president of the Otago Tramping Club.

A very popular musical play, "Going Up," will be featured at 4YA and relayed to 3YA, when all the principal vocal numbers, in solo and concerted form, will be sung by "The Majors."

Humorous numbers will be contributed by Mr. Lester F. Moller, and light instrumental music will be added to the programme by a quintet under Mr. A. H. Pettitt. Piano novelties will be contributed by Mr. Pettitt.

### 2YA Church Committee

THE 2YA Church Service Committee met on Tuesday, July 7, there being present: Revs. C. V. Rooke (chairman), T. R. Richards (Methodist), R. J. Howie (Presbyterian), Pastor W. G. Carpenter (Church of Christ), Mrs. D. Basham, Mr. J. Ball.

The Rev. E. N. Goring advised that the Rev. L. J. Boulton Smith, the new minister at Vivian Street Baptist Church, would succeed him as representative on the committee. The committee passed a resolution appreciative of Mr. Goring's services.

The question of rearranging dates on the church broadcast rota was discussed, and it was decided to make no change. The present rota for the children's sessions was also approved for the coming year.

## How the Valve Grew Up

(Continued from page 3.)

York. McCandless's became the first valve plant. His men, skilled glassblowers that they were, made the early audions, which were sold mainly to wireless experimenters for use as a detector. The audion was supplied with a wooden cabinet containing flashlight batteries for the "B" circuit, and with binding-posts and switches for the necessary connections. According to one of our early advertisements: "The audion detector is operated by heated gases, employs a local battery and is complete with switches, batteries, rheostat and necessary connections. It is fully protected by U.S. patents Nos. 879,532, 979,275 and others granted to Dr. Lee De Forest and held by the Radio Telephone Company. It is pronounced by experts to be the very best detector obtainable anywhere. Renewal audion bulbs may be secured, in exchange for old or broken ones, for 3.50 dollars or 5.00 dollars each. All valves are tested before shipment, but the 'X' or 5.00 dollar bulbs are tested for the maximum possible sensitivity. With the audion you can easily

## The Children's Radio Hour

*Sunday evening in the country,  
 clouds unfold their silvery wings  
 O'er blue bays, while near the path-way  
 goldenly a bellbird sings.*

*Glowing sunbeams change the floating  
 thistledown to fairy flocks,  
 Where the everlasting daisies kneel  
 beside the lichen'd rocks.*

*But more sweet than elfin music  
 stealing through the balmy air,  
 Sound the children's voices praising  
 God, who made the world so fair.*

—Midsummer.

increase your range from 50 to 100 per cent."

Our first audions made use of tantulum filaments. Usually a double-loop filament was employed, with three pigtail leads, so that one or the other loop might be used. When one loop or filament burned out, another was still available, thereby giving the short enough life of those audions a double span, so to speak. The valves were quite gassy. The plate voltage had to be delicately adjusted so as to be set at the most critical value. If increased beyond a given point, the valve would suddenly light with a purplish glow, and the signals would become garbled.

In time, the audion came into use for telephone purposes. It was in 1915 that the American Telephone and Telegraph Company, employing the De Forest amplifier, inaugurated the first transcontinental telephone services between New York and San Francisco. The same year that organisation, using my "oscillions," or oscillating audions, made successful wireless telephone tests between Arlington, Va., and the Eiffel Tower in Paris, and again with Pearl Harbour, in Hawaii. So thoroughly convinced were wire and wireless men of the value of the audion or three-element valve

that the device received no end of research and engineering development. In 1917 I entered into an agreement with the American Telephone and Telegraph Company, whereby that organisation secured certain rights under the audion patents and whereby sufficient audions might be made available to the Army and Navy for radio communication during the World War. The telephone company, in turn, re-licensed others to make and use the audion, so that to-day every reputable valve manufacturer is a re- licensee under the DeForest audion patents.

Until the dawn of broadcasting, vacuum valves were made by means of more or less laboratory equipment. The relatively small volume of production could be cared for by glassblowers, with a minimum of machinery. The existing lamp-making machinery was found ample, particularly since the tolerances for vacuum tubes were fairly wide. The prices asked for valves were such that they could be made piecemeal and without much regard for cost.

But with the inauguration of broadcasting and the sudden demand for valves by the public at large, the making of vacuum valves became a real industry. No longer was it a question of supplying thousands of valves. Rather, it was a matter of supplying millions of valves to operate the sets in millions of homes. For the first year or two of broadcasting there existed a market shortage of valves. There were times when the list prices meant nothing as regards a maximum. Valves often actually sold at a premium, because of the greater demand than supply.

By degrees, the valve industry geared itself to the demands. Automatic equipment was installed in the better plants. The skilled glassworker was replaced by the automatic machine, with its batteries of blue gas flames, its mechanical arms and fingers, and its constant merry-go-round operation for continuous production. Girl operators came into the industry, mounting and spot-welding the metal parts in place on the glass stem, and loading and unloading the automatic machines, followed by testing, inspection, wrapping and packaging. If one will glance at an early DeForest audion, with elements spaced 1-inch or more apart, then at the first 201 valve of early broadcasting days, and again at the present -27 heater type a.c. valve, and the more complicated four-element valves, one is immediately struck with the growing delicacy of valve construction. The greater accuracy of automatic machinery made possible closer tolerances and more accurate valves.

(With acknowledgments to "Radio News.")

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