

OUTSTANDING DATES RELATING TO WORK OF W. G. CADY IN PIEZOELECTRICITY

PREAMBLE

The first date is June 14, 1917, the opening of the conference in Washington on submarine detection, arranged by the U.S. Navy and National Research Council, and organized by R.A. Millikan.

Early in 1917 I had had a visit from Dr. L.A. Bauer, under whom I had worked in the Magnetic Survey 1900-1902. I told him of the thinking I had been doing on possible methods for detecting submarines, particularly of the use of the Hughes induction balance, or of magnetostriction to generate a narrow acoustic beam. It was probably at Dr. Bauer's instigation that I was invited to the conference.

At the conference I was especially attracted by the report of the French delegates on Langevin's experiments with a piezoelectric transducer, and decided to concentrate on that method.

On June 26, 1917, I had a visit from Bumstead of Yale and Nichols of Cornell, who were on a committee for planning a piezoelectric program. I described my plans to them, and at their suggestion I began work July 3 at the General Electric laboratory in Schenectady, in cooperation with A.W. Hull, where I devised various forms of quartz and Rochelle salt units for receiving ultrasonic signals. I spent most of the time there until Oct. 18, 1917. On December 19 I began cooperation with Pupin, Wills and Morecroft at Columbia, though most of my share was done at Wesleyan, working on receiving devices, while Wills constructed a Langevin-type sandwich.

We tested the sandwich, using my receivers, at the Navy Yard in Key West, Feb. 20 to March 8, 1918. Then our tests were moved to the Naval Station in New London, Conn. I was there at intervals from June 27, 1918, to Jan. 20, 1919, *and also made later visits*

The chief dates for this early work are in my notebook DW, pages 44 to 47. They deal with methods of cutting and mounting plates of quartz and especially of Rochelle salt, but contain no new discoveries.

The dates below cover the chief events after that time, mostly at the Wesleyan physics laboratory.

1919

Jan. 4, Crystal in a generating circuit, observation of minimum in current at a critical frequency. Notebook 25, pp. 6, 7.

Feb. 10, experiments with crystal having two pairs of electrodes as a coupling device between two circuits (the first filter). *(nb 25, p. 49)*

Feb. 22, showed resonators to Arnold of Bell Labs., Wendell of Columbia, and Van Dyke of Wes. Told them of the coupling device, also my observation of the negative capacitance of Rochelle salt plates at certain frequencies, which I had made Aug. 15, 1918 (nb 23, p. 109).

Mar. 13, first observation of the "Click" heard on varying the *tuning* capacitor of a generating circuit containing the crystal. *(nb 25, p. 67)*

Mar. 30, talk with Commander de Frees in New London concerning crystal wavelength standards and my plan for a patent.

Dec. 9, First use of steel rod with crystal attached (nb 25, p. 156).

1920

May 26, first measurements with mounted crystals (nb25, p.196).

Dec. 17, visit from Arnold and Horton of Western Electric. Showed them mounted resonators (the "piano") and steel rods. Gave Arnold steel rod F12 to take away.

1921

Jan. 10, the "key-tapping method" introduced. (nb 25, p. 217)

Jan. 25, attempt at feedback from F13. First entry on the subject of the stabilizer. (nb 25, p.225)

Jan. 27, sent steel rod F13 to Arnold. (nb25, p.227)

Feb. 26, read paper on resonator in New York.

Feb. 28, first stabilization, Quartz rod, 2 pairs electrodes. (nb25, p.237)

Mar. 3, theory of stabilization. (nb25, pp.241, 242, 253)

Mar. 12, First stabilization with quartz using only one pair of electrodes in parallel with the grid capacitance. (nb25, p.246)

Apr. 1, First stabilization with quartz using only one pair of electrodes, this time in parallel with the tuning condenser, the preferred location. (nb25, p.250)

Apr. 6, introduced the term "stabilizer".

May 3, the first oscillator. Quartz with 2 pairs of electrodes, 3-stage amplifier, no L nor C. (nb25, p.272)

July 27, sent to Arnold a copy of the application for my first patent, on the resonator.

Oct..11, Arnold writes that Western Electric can't use my devices.

Oct. 19, conference in New York with Arnold, Blackwell, Hartley, Carson, Horton, Espenschied. Left with them units H3, H4, and F19. Showed them F23.

Nov. 2, read paper on the resonator at IRE meeting in New York.

1923. Tests of resonators in Italy, France, and England, April 13 to July 20. (nb26, pp 227ff.)

1925. Feb. 28, talk with Nicolson, who denied having thought of the crystal resonator or oscillator.

1937. Introduced the Rochelle salt L-cut, read a paper about it at meeting of the Phys. Soc. of London, July 9.