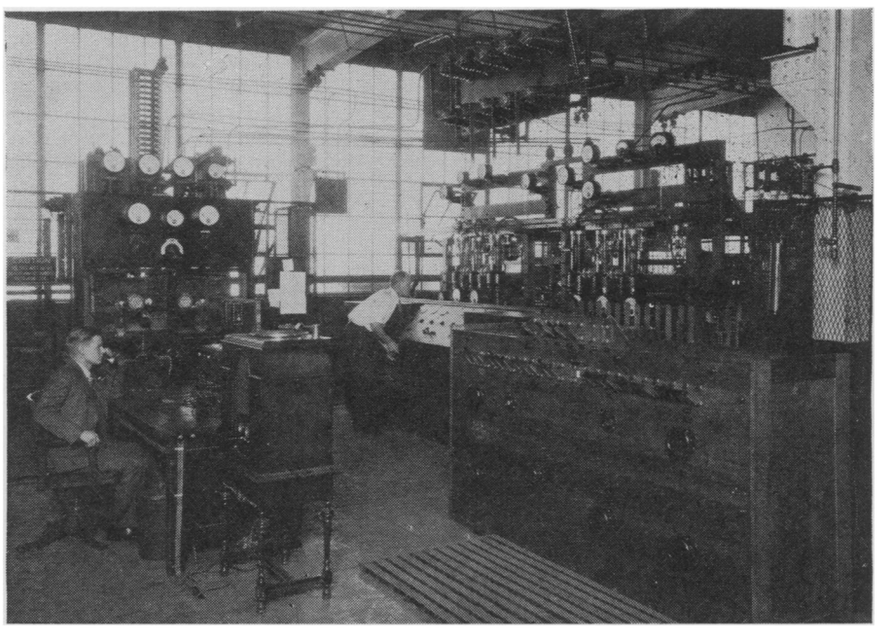
New Radio Station Has Highest Power

Radio



Here is the heart of the 200 kilowatt broadcast transmitter at WGY. At the left is the intermediate power amplifier and to the right is the main power amplifier. Just in front of the operator leaning over the switchboard can be seen the six 100 kw. tubes that make this station possible.

BROADCASTING with 200 kilowatts of power, four times as great as the highest powered regularly licensed station, was successfully accomplished by Station WGY of the General Electric Company, Schenectady, N. Y., on Sunday, March 9. Using a special experimental license, with the call letters W2XAG, the highest power ever used in broadcasting was put on the air at 4:00 a. m. eastern standard time. Experiments were continued for seven days at the same hour, which was chosen to prevent possible interference with other stations of the country.

Tests on 200 kilocycles have been reached by easy stages on progressively higher power. In July, 1925, WGY was the first station to work on 50 kilowatts and since that date many stations have been licensed by the Federal Radio authorities to use on their regular programs at all hours what was once regarded as super-power. In August, 1927, WGY advanced to the next stage—100 kilowatts. Early in January, this year, without any prior announcement and without informing listeners what power was being used, WGY, on its license W2XAG, broadcast a series of recorded programs on 150 kilowatts.

Now General Electric engineers have begun tests on 200 kilowatts. The transmitter is located on the 54 acre radio laboratory a few miles south of Schenectady where facilities are available for the power and cooling requirements of a large number of transmitters. There are, for example, four steel antenna towers, three 300 feet high, and one 150 feet high, and in addition a large number of small masts, between all of which are many different types of radiators or antennas. At the main power house one of six rectifiers is capable of supplying 750 kilowatts of direct current at 20,000 volts.

The design of apparatus capable of handling 200 kilowatts of power was preceded by years of exhaustive investigation and a slow progress from low to higher power. Probably the greatest single impetus to the art of high powered broadcasting was the development of the 100 kilowatt, water-cooled power radiotron in the vacuum tube department of the General Electric Company's research laboratory. Instead of complicating design to produce high power through the medium of many 20 kilowatt water-cooled tubes, the design was simplified by the use of a few 100 kilowatt tubes. 100 kilowatts is a conservative rating for these power tubes which are actually capable of considerably greater outputs.

In the 200 kilowatt transmitter there are six 100 kilowatt power tubes. Each tube is five feet long or seven and a half feet when included with its water jacket.

Direct current supply for the 200 kw. power linear amplifier is obtained from a six-phase rectifier utilizing twelve phanotrons, which are air-cooled, hot-cathode, mercury-vapor rectifier tubes. The power amplifier feeds a radiator system consisting of a vertical cage antenna and radial counterprise. The antenna current corresponding to 200 kilowatts is 92 amperes.

The 200 kilowatt power amplifier is driven by a five kilowatt intermediate power amplifier very similar to the commercial five kilowatt broadcast transmitter and uses two 20 kilowatt water-cooled tubes in a push-pull circuit.

The frequency of the transmitter is controlled by a 790 kilocycle piezo-electric quartz crystal maintained at constant temperature. The deviation from 790 kilocycles is never more than a few cycles, as checked by the General Electric general engineering laboratory's primary standards. The overall fidelity of tone of the transmitter is unequalled. A recent measurement of the overall frequency characteristic shows a departure from ideal transmission of only two per cent at frequencies corresponding to the lowest notes produced by any musical instrument, and but slightly greater reduction at 10,000 cycles. The transmitter is thus able to reproduce faithfully the overtones of any musical instrument. In the 200 kilowatt transmitter the identity of musical instruments is well preserved because the higher harmonies which color the tone of each instrument are not lost on the way through the various stages of the transmitter.

In order to keep the giant tubes of the transmitter properly cooled, it is necessary to circulate 15 gallons of water per minute through the water jacket surrounding the anode of each tube. For the transmitter proper a flow of 100 gallons per minute is required. This is obtained from a cistern with approximately 20,000 gallons capacity.