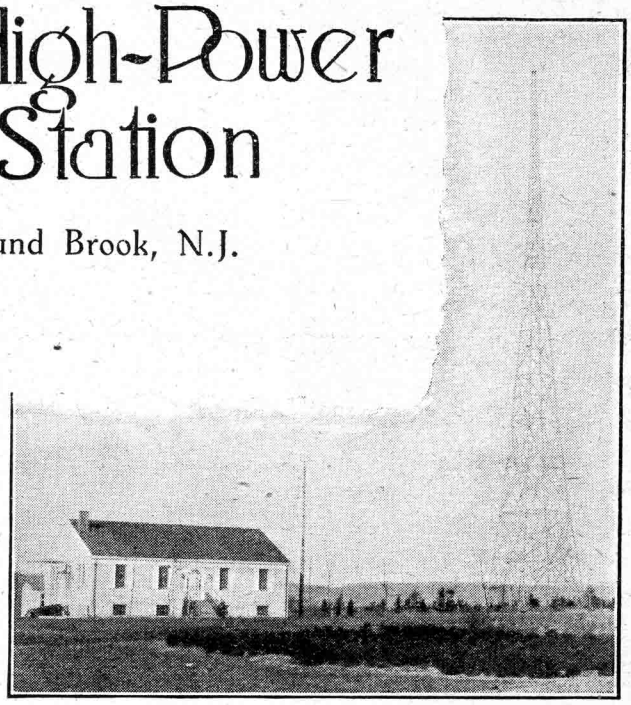
America's New High-Power Broadcasting Station

A Description of the Station at Bound Brook, N.J.

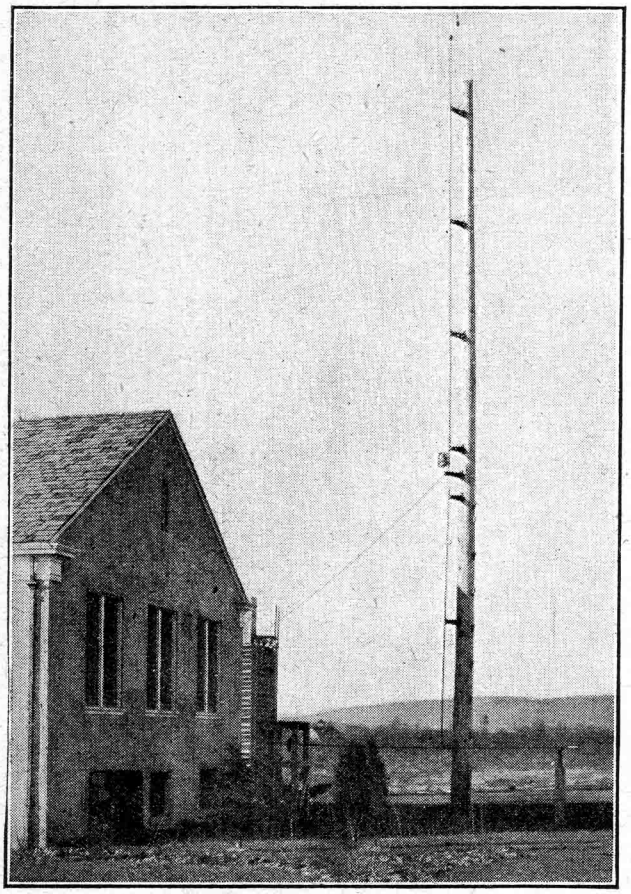
By A. DINSDALE.

IN this country we have recently become familiar with discussions as to the relative benefits of a few high-power broadcasting stations, judiciously located, as an alternative to our present system of a multiplicity of low-power stations scattered all over the country.

In America, where innumerable small stations abound, the problem is even more acute, and the leading protagonists of the high-power system have for some time been busily engaged in building super-power experimental stations to prove their arguments. The latest of these stations to be completed is situated at Bound Brook, New Jersey, some thirty-five miles from New York City, and was built by the Radio Corporation of America, to whom the writer is indebted for the following particulars and photographs of the plant.



General view of the station buildings, the short-wave aerial, and one of the lattice masts supporting the aerial for the 450 metre transmitter.



Short-wave aerial system. The conductors consist of copper tubing and are spaced from the wood mast on porcelain insulators.

Bound Brook has not yet been officially opened, but is at present operating under an experimental licence on two wavelengths in the vicinity of 450 and 100 metres, using in each case an output power of 50 kW. and the experimental call sign 2XAR. When officially opened the station will use the call sign WJZ, which is at present allocated to the Radio Corporation's 500-watt station on the top of the Æolian Hall, New York. At present 2XAR gets its programmes from the WJZ studio, which is connected to Bound Brook by three private lines.

The Aerial and Earth Systems.

The aerial for the 450-metre transmissions is carried by two self-supporting steel towers, each 300ft. in height, the feet of which are mounted on heavily insulated bases. The distance between these towers is 700ft., but the length of the aerial is 220ft. It is of the 6-wire cage type, the down lead being taken from the centre. In order to ensure that the strain on the aerial wires shall at all times be uniform, the halyards are brought down to a 2,000-lb. counterpoise weight.

The earth connection is composed of a large number of wires buried several feet in the ground, which radiate in all directions from the station building.

For the short-wave transmissions a different aerial system is employed. This consists of a vertical copper tube mounted on insulators and supported by a wooden mast. Readers will be familiar with this design, which has been in use for some time past at KDKA. In one of the accompanying photographs the short-wave aerial can clearly be seen close to one end of the station building.

The main power supply, which is fed to the transmitting station through a small sub-station situated near one

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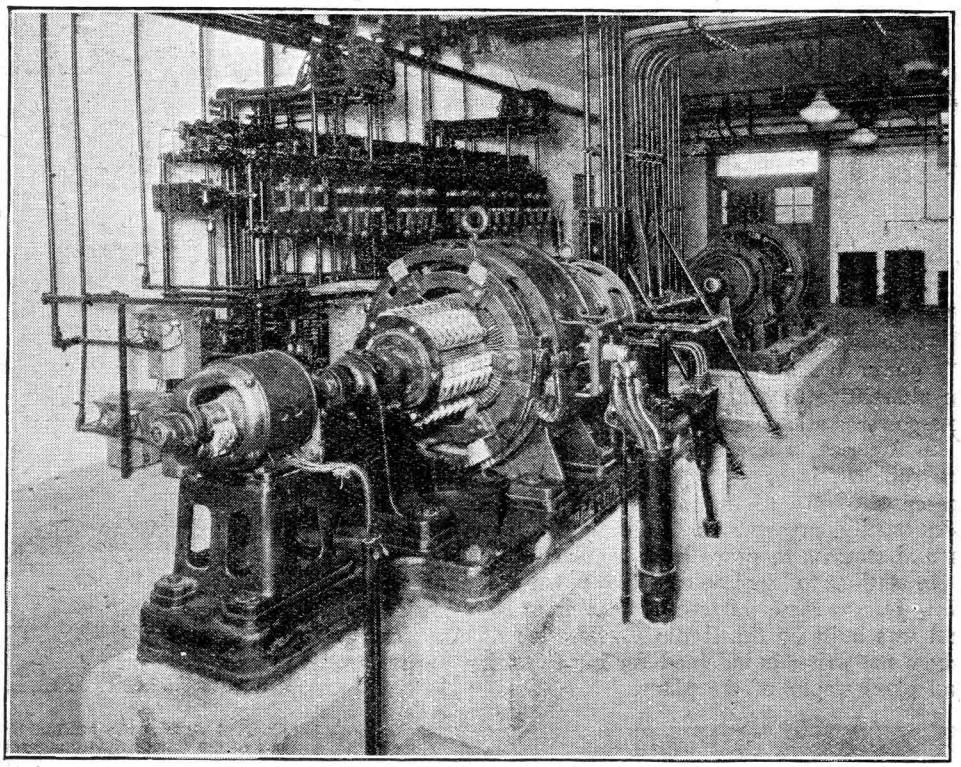
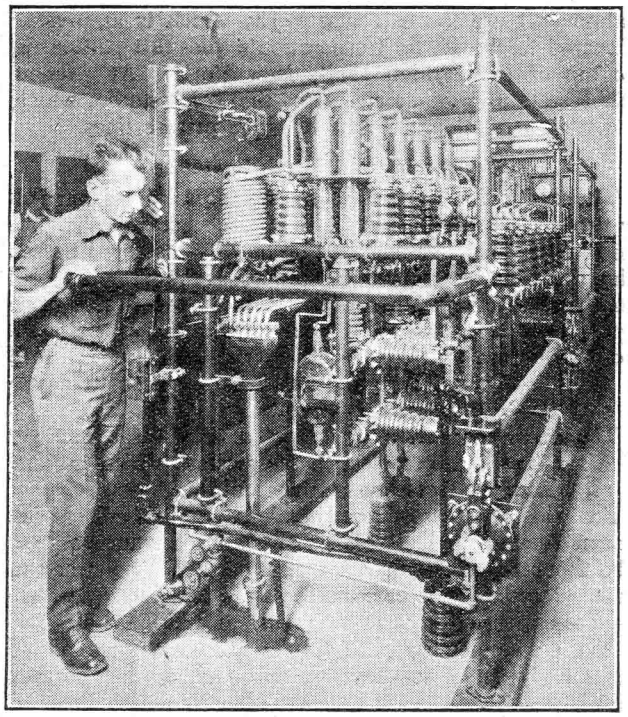
of the aerial towers, is 3-phase, at 4,400 volts, 60 cycles. The switch gear for controlling this power is placed in the basement of the main transmitting building, and can be seen in one of the accompanying illustrations, which also shows the two filament-lighting motor-generator sets. These sets supply filament current at 15 volts, and in the space between them is located the switchboard for changing the filaments over from one generator to another.



Motor generator sets in the basement. The switchgear for the 4,400 volt, 3-phase supply mains is to be seen in the background

Power Supply and Running Machinery.

Also situated in the basement are the high-tension transformers, six in number, for supplying the high-voltage plate current for the water-cooled transmitting valves. This high-tension current is taken to the main transmitting room immediately over the basement for rectification by means of water-cooled two-electrode valves, and then back down to the basement for smoothing by means of a large bank of mica-dielectric smoothing condensers and five huge iron-core chokes immersed in oil. The resultant D.C., at 10,000 volts, is fed back to the transmitting room and applied to the plates of the oscillator and modulator valves.



Modulator frame of the 450 metre transmitter. Valves with water-cooled anodes are employed.

The Radio-frequency Equipment.

The transmitting panels for both wavelengths are in duplicate, and they are all arranged round the sides of a large transmitting hall on the main floor of the building. In erecting this structure copper shielding was introduced into the walls, in order to minimise the danger to near-by receiving stations of interference from unwanted harmonics. Such screening very effectively eliminates this interference.

Each transmitter consists of three separate panels—the rectifier, the modulator, and the oscillator. Each oscillator employs eight, and each modulator twelve, water-cooled valves. The cooling arrangements are quite elaborate. From a water-cooling tower close to the main building water is conducted through metal piping up to the transmitting panels, but the actual connection between this piping and the water jackets of the valves is made through rubber tubing. The inlet and outlet tubes are both about 15ft. long, and these lengths are coiled up together in the form of a spiral such as can be seen in the illustrations.

These spirals are provided in order to lessen the leakage of the high-tension plate current, for the cooling water comes in actual contact with the plate. Pure water is an insulator, but in the case of a transmitting plant of this size it is hardly practicable to arrange for an abso-

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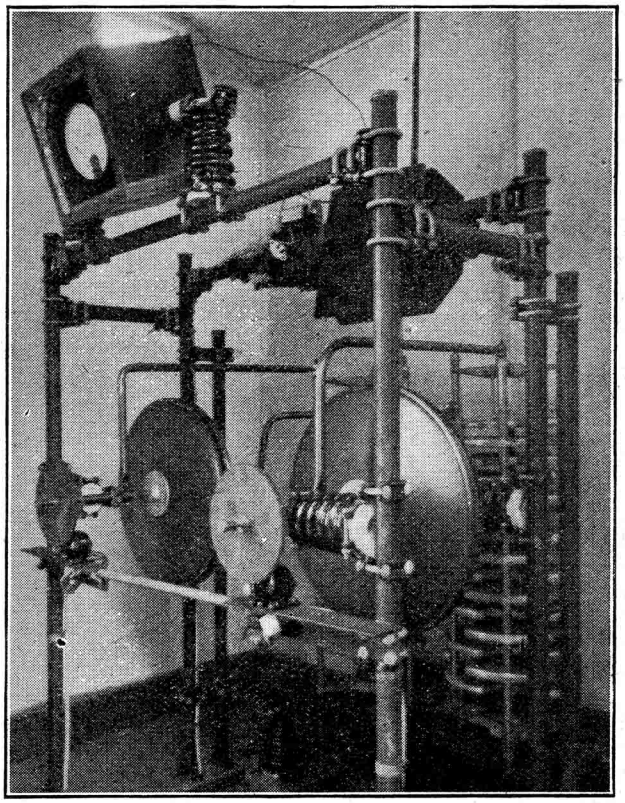
lutely pure water supply. Some idea of the water requirements may be gathered from the fact that 3,300 gallons of water per minute are necessary. By insulating the water column for a distance of 15ft. or so between the valve plate and the metal supply piping, therefore, leakage by way of the water supply is reduced to a negligible extent.

Tuning Arrangements.

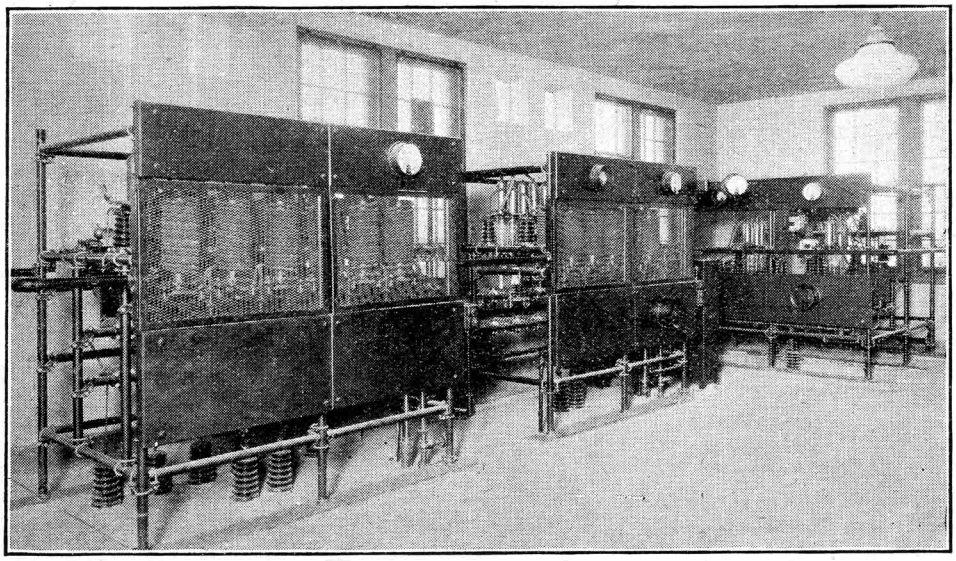
Tuning of the closed circuit is effected by means of a large strip inductance and variable air condenser, both of which are very clearly shown in one of the photographs. Tappings can be taken from the inductance at selected points by means of specially designed clips. The plates of the variable condenser are of large area and very thick, with rounded edges.

Coupling to the aerial is obtained by means of a single turn coil which is hinged on to the end of the closed circuit inductance. Leads from this single turn coil are taken out of the building to a small hut near by, which is directly below the aerial lead-in, and which houses the aerial tuning apparatus. This apparatus is contained in a single panel, and consists simply of a small inductance, two variable air condensers, and the aerial ammeter, the scale of which reads up to 30 amps.

A unique feature of this panel is the fact that the two variable condensers are controlled by two small electric motors through reduction gearing. These motors are controlled by a small jack switch mounted on the extreme left of the oscillator panels, so that the aerial tuning can be remotely controlled by the engineer in charge of the station without leaving the main transmitting hall. This is a development of aerial tuning and coupling which has been in use for some time at other stations of the Radio Corporation of America. By its use the aerial is energised at its base, without the necessity of bringing the actual aerial lead-in round awkward corners and through walls. An additional advantage is that the aerial is free to oscillate with a minimum of interference from the other high-frequency apparatus housed on adjacent panels within the main building. The advantages of such a system are much sharper tuning and greater freedom from harmonics.



Tuning controls driven through reduction gears by small electric motors to avoid capacity effects which might be caused by the presence of an operator.



The short-wave transmitting equipment, which includes the rectifier, oscillator and modulator frames.

No doubt, when Bound Brook is officially opened and commences to broadcast regular programmes it will be one of the American stations most regularly received in this country, especially on the shorter wavelength. Already, during an experimental test, signals on the short wave have been picked up in this country and rebroadcast by the B.B.C. From the American point of view, the new WJZ should prove of great value as a link in that country's broadcasting chain for the dissemination throughout the United States of important national events. On both sides of the Atlantic its performances will be watched with the greatest interest.