

**S**TATION W6XAH, Bakersfield, California, is the first station in the West to use single sideband suppressed carrier transmission. This system permits the transmission of more detail and of course a better picture within the limitations of the frequency channel allocated by the Federal Radio Commission, which is 100 kilocycles at this time.

W6XAH is licensed to transmit 96 lines, 20 picture frames per second, (1200 R.P.M.) and scans left to right and top to bottom in continuous sequence. (R.M. A. Standard.)

It was quite interesting, during the development work, to note the amount of increased detail which was available between the 60 line picture and the one using 96 lines, both pictures being transmitted at 20 picture frames per second. In the 60 line picture, small objects were not seen at all! In the 96 line picture even the shading under trees was easily seen, as well as the details of the facial features of individuals.

#### Halving the Frequency

It is also possible when using the ninety-six line picture, in the transmission of moving picture film, to use practically any kind of film, the darkest type coming through with good fidelity.

If one attempted to transmit 96 lines without the use of single sideband transmission the channel width would be more than 184 kilocycles, which, of course, is out of the question. Its advantages are many compared to other methods of transmission, and will be shown in a latter part of this article.

By the use of the increased detail obtained by 96 lines, it is possible to take

outdoor scenes of tennis games, boxing matches, etc. In the studio the scenes televised show the artist and the furnishings of the room, windows and other details which go to increase the atmosphere for a stage setting.

The transmitter is housed in a building consisting of two rooms, each 24 feet wide and 48 feet long. One room houses the main transmitter and the power control panels, and also the speech input

panels and monitors. The main transmitter faces the front. Along the left side of the main transmitter is seen the single sideband equipment, which is housed in a separate screened-in panel. On the right side of the room are the generator control panels, consisting of 3 panels.

In the rear of the room on the right side are two banks of power transformers (each 15 kilowatts), supplying the power for the rectifiers. Both generators and rectifiers are used to supply the power in transmission. The filaments are operated by a direct current generator. On the left of the room is shown the speech input panel, the sideband panel being shown at the right.

In the room adjoining are the main television amplifier, the projection machines, and the pre-amplifiers, the picture which is transmitted actually going through 17 stages of amplification.

#### Complete Laboratory Equipment

Great care in building these amplifiers was necessary, as the frequencies involved vary over a wide range. The main amplifier, having eight stages of specially designed amplification, has a frequency range from 30 to 95,000 cycles. Its characteristics are practically flat from 50 to 80,000 cycles.

In this room also is the machine shop, which is well equipped for this type of research. It also contains the usual testing equipment, oscillographs, low-frequency oscillators, frequency measuring apparatus, etc.

The studio building is located approximately 50 feet from the first building. It contains the direct pick-up cameras and associated amplifiers, two condenser microphones, piano, studio furniture, etc. An underground line connects the studio with the transmitter rooms.

The two towers are each 150 feet in height, and were made of wood to keep down absorption and re-radiation. They are separated 150 feet. The antenna itself is a large single wire, fed by a transmission line.

#### Lower Power Consumption

Even disregarding the previously mentioned advantages possessed by the single sideband system, that there is less interference due to the sharper tuning permissible in the receiver and that the received signal strength is subject to less variation due to changes in the ether conditions, this system has the advantage of lower power consumption for given results. The maximum power required is one-fourth of that for the usual transmitter. It is important to remember that the power output of a single sideband transmitter is zero when no speech or picture is transmitted and that the output varies from zero to full load each time a word is spoken.

This is one of the reasons for the large size of our power supplying apparatus and generators.

It is quite interesting to note the different methods employed in the production of the single sideband.

It is well known that, when alternating carrier current is modulated by voice or picture currents, the resultant wave is distributed over a frequency range which may be considered in three parts: (1) The carrier frequency itself, (2) a frequency band extending from the carrier upward, and having a width equal to that of the frequencies appearing in the modulation wave, and (3) a band extending from the carrier downward, and having a similar width. The products of modulation are spread over a region comprising the original carrier frequency and the two bands, known as the upper and lower sidebands. These two bands have the same width and each transmits power which contains all the elements necessary to reproduce the original speech or picture transmitted. The ordinary transmitter transmits all of the products of modulation (carrier and two side bands). It also sends out the carrier continuously and adds the two sidebands when they are impressed, as when a word is spoken.

The total transmission or frequency range is from the peak of one side band to the peak of the other or from top to bottom. In the single sideband, elimin-

ated carrier method of transmission, no power is radiated except when a word is spoken into the microphone, or a picture applied. A combination of modulators and filters is applied to eliminate the carrier and the upper side band in the case of W6XAH. The width of the sideband transmitted is slightly less than one-half of that which is transmitted in the usual transmitter. In the case of W6XAH this half is made twice its normal size or equal to 92 kilocycles, in the transmission of 96 lines, 20 picture frames per second.

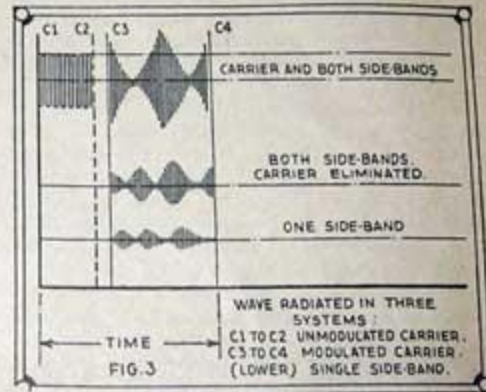
The entire apparatus was designed and built by Mr. Frank Schamblin, president of the Pioneer Mercantile Company, and the writer.

#### New Scanning Methods

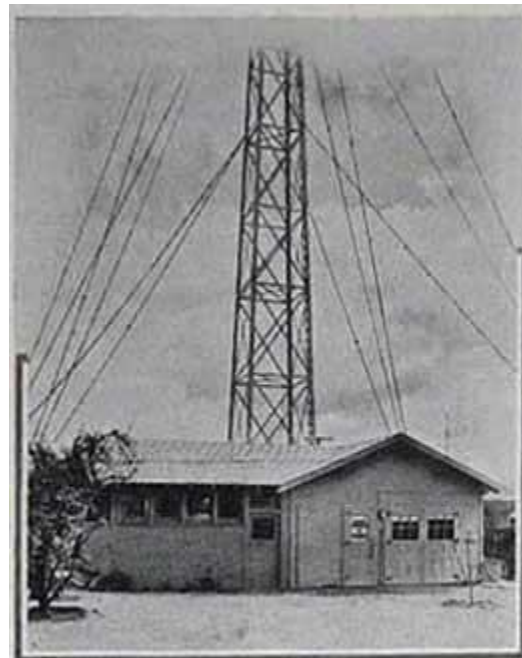
A new and revolutionary method of scanning is now being developed in which the scanning disc is entirely eliminated, together with the photo-electric cell and all light.

On its test programs W6XAH has been reported from practically the entire United States. It is the largest visual station west of Chicago.

The reader understands, of course, that special sets must be employed for the reception of television signals transmitted by the single side band system. Data on this subject will be published in forthcoming numbers of TELEVISION NEWS.



Showing advantage of single side band transmission in saving of channel width for television transmission. The single side band is less than half normal amplitude as when carrier is transmitted.



General view of the transmitting station with part of one of the antenna towers in the background.



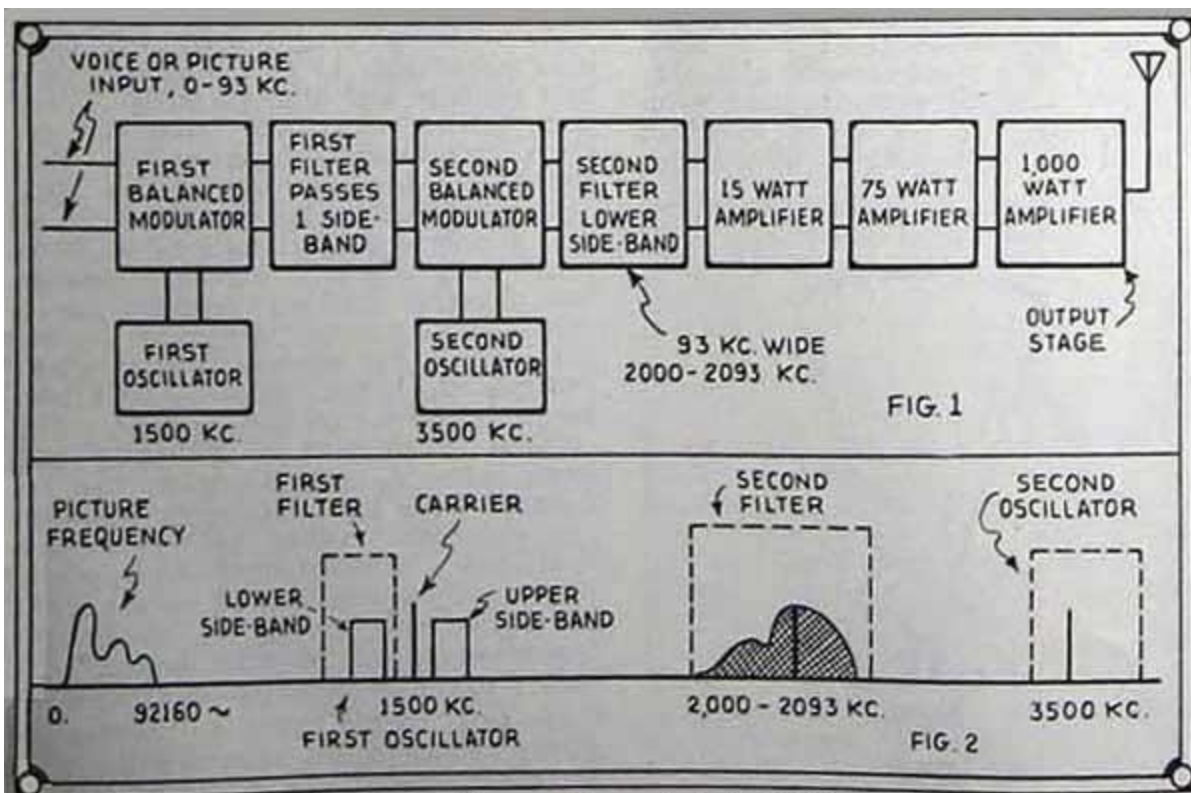
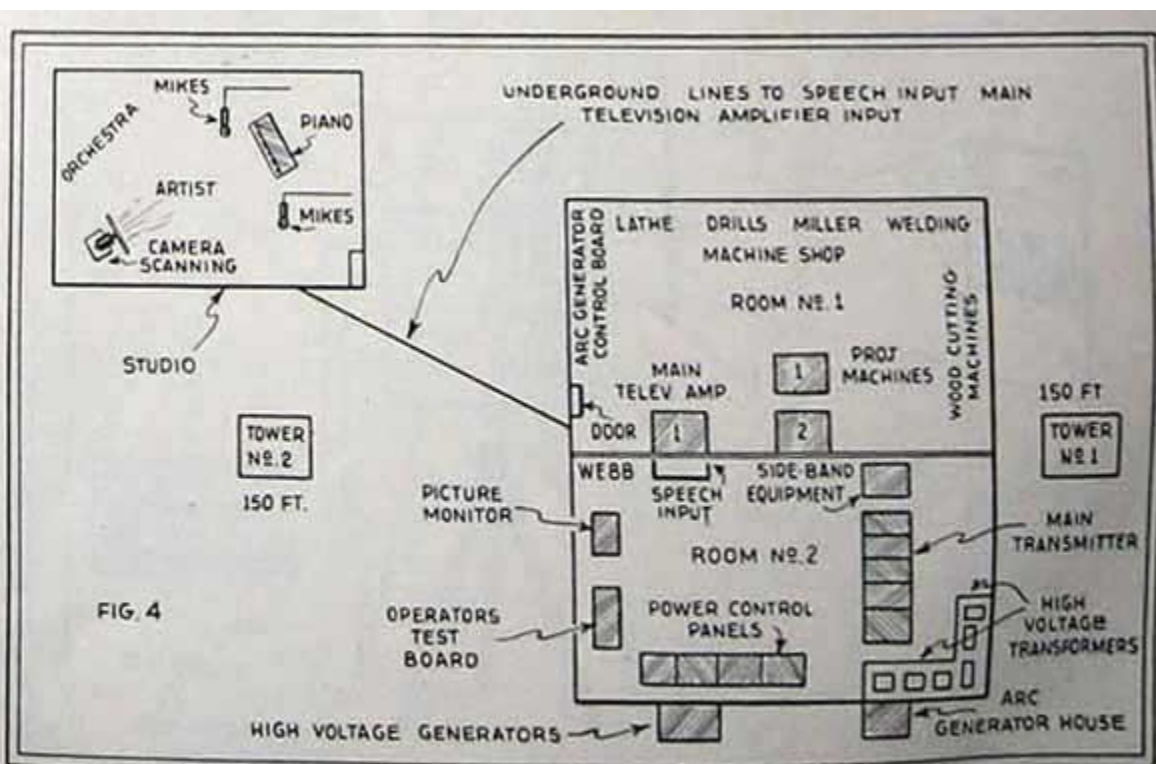


Fig. 1: layout of the transmitter equipment at W6XAH. Fig. 2: position of the side bands in the double modulation process. The transmitted sideband is separated sufficiently to be free of all harmonics of both oscillators.



Layout of the entire W6XAH station. Note that the studio building is separated from the transmitter house, which is located conveniently between the aerial towers.



R. D. LeMert, left, and Frank Schamblin, right

Television News, July-August 1932

Courtesy of Tom Genova