

Our Latest Broadcasting Station

By B. F. BURCH

On the evening of January 10th, one of the most powerful Radiophone Broadcasting Stations in the South was dedicated to the service of Alabama. The new station of the Alabama Power Company is located in the Department Store of Loveman, Joseph & Loeb, at the corner of Third Avenue and Nineteenth Street, North.



The Antenna System was constructed on the roof of the four-story main building and the operating room, which houses the electrical machinery, was built on the roof of the Annex adjoining, while the Concert Room, or Radio Studio, for the artists may be found in the Radio Shop of the store at 1817 Third Avenue.

Before the Antenna could be put in place, a 65-foot pipe tower of our own design had to be erected at an air line distance of 125 feet from a large water tank on the seven-story Annex. The tower was supported by three guy wires anchored in the sides of the building. The Antenna proper was made up of six solid copper wires, 110 feet in length spaced on 3-foot centers on bamboo spacers. The ends were insulated with long procelain insulators known as "Hun Killers." The Counterpoise was made up similarly to the Antenna, except that it had a greater spread and was insulated with strain type insulators and suspended 50 feet below it. When the Station was first put in trial operation, during afternoons, it was impossible for employes of the store to hear anything over their telephones except the market reports or the

music which was being given out in the Radio Studio. On account of this condition and the interference of the iron pipes in the sprinkler and heating systems with the tuning of the set, it was necessary to put a wire mat on the roof under the Antenna System. This mat was composed of bare copper wire with suitable spacing, and was spread over practically the entire roof. By thoroughly grounding this network and all other metal work on the roof, the ground conditions were stabilized and the interferences eliminated to a practical degree. Stranded copper

cables were used to connect the Antenna, the Counterpoise and the grounded mat network to the set.

The Operating Room, which is 22 feet by 12 feet by 9 feet high, was constructed of hollow tile at an elevation of 115 feet above the ground. Considerable difficulty was experienced in getting the building material and the electrical equipment to the roof, owing to the great height to which they had to be raised.

A view of the interior of this room and of the studio is shown. The Power Panel may be seen near the right hand corner of the Operating Room. Upon it are mounted a tuning helix for adjusting the Antenna Sys-

tem to the wave length required by the Federal Government, and five 250 Watt, 2,000 Volt Power Tubes, two of which are used as oscillators and three as modulators. The latter are controlled by a 50 Watt, 1,000 Volt Power Tube. The filaments of these tubes are heated by means of a 3-horsepower, 220 Volt, three phase motor-generator set, delivering cur-



rent at 12 volts. The plates are excited from a 5-horsepower M. G. set having two 1,000 volt generator units connected in series. As the plate generators would introduce a very serious hum into the broadcasting, a comprehensive filter system was developed which practically eliminated this undesirable feature. A separate Power Control Panel with suitable protective devices and starting switches was located near the Power Panel. Both of these panels were equipped with small indicating meters for showing at all times the values of the currents and voltages which are being delivered to the apparatus. Across the room, a Power Amplifier with its high voltage lead storage battery was located.

On account of the tremendous amplification represented in the amplifier, an extraordinary amount of patience and care was required to develop it. The adjustments were very critical and even slight changes in its resistances, condensers, grid leaks, etc., caused it to sound more like a young baby than a perfect reproducer of musical selections. Yet with another slight change it would be as fine as could be. It was so sensitive that if one's hand was placed near it, it would cry out as in pain through the loud speaker attached to its output. In its present location, it is so carefully shielded that howls have been practically eliminated. Many trying days were spent in continual testing to perfect the reproduction and obtain the amplification sought. It was a continual fight of care and patience against pressure of necessity in completing the work as soon as possible. As a result, this Amplifier, together with the one installed in the Studio, magnifies the "electrical sounds" ten million times, but maintains practically all of the tonal qualities of the original; so that almost perfect reproduction is obtained. Some idea of the magnitude of this amplification may be gained when it is appreciated that the electrical output of the pick-up transmitter in the Studio when being sung into is so weak that it is inaudible in a pair of head receivers, while the output when connected to a loud speaker is decidedly uncomfortable to listen to, yet keeping its quality.

When this degree of amplification is used, cables which appear to be silent become noisy. For instance, there are a number of cables extending from the Studio to the Operating Room. Soon after they were installed, each was tested with a radio head-receiver and found to be silent, but when the power amplifier was connected they were so noisy that it would have been impossible to send music over any one of them. This condition was remedied by putting in a thoroughly grounded copper cable the entire

length of the other cables and bonding them together at intervals.

The operator's desk is diagonally across the room from the Power Amplifier and is located so that the operator has a good view of the meters on the Power Panel. From these he can tell at all times how much power the set is putting out, and can maintain full output at all times by means of a hand-control in the panel on the top of his desk. This panel also contains eight trunk keys, a small flush switch, for lighting the Program Director's signal light in the Studio and a similar one at the right of the switch for the Operator's observation. As soon as the Operator presses the flush switch, the Program Director knows from the lighting of the green signal lamp that the station is ready for sending out the programs. If, for any reason, the station should cease to radiate during the program, the signal lights are put out.

There is a desk stand telephone on the Operator's desk which is normally connected to the Studio so that he can converse with the Program Director in cases of emergency. A key has been provided on the extreme right of the panel, so that this telephone can be connected directly to the Broadcasting Apparatus. During the recent sleet storm, this connection was used when messages were relayed to the various Generating Plants for the Chief Load Dispatcher at Magella Substation. As WSY at that time was the only means of communication with the outside world, a considerable number of messages were sent out in this way. On account of the transmitter being in the same room with the motor generating sets, considerable hum was present in the broadcasting.

By means of the trunk keys on the desk, it is possible for the Operator to connect at will any of the trunk lines to the broadcasting apparatus. Trunk lines extend to various churches throughout the city, to the Brown-Marx Building, and to the Radio Studio. A Monitoring System is also provided so that the Operator can listen-in on all the trunk lines at one time and tell when the Program Director is about ready to start a program. By using this system and a special arrangement with the Operator, the machinery is placed in operation only a few minutes before the program starts, and a very considerable amount of maintenance is saved during the year to perishable apparatus. In case of unavoidable delays in starting a program, the set need not be operated unnecessarily. By this method, it is not even necessary to operate the Power Amplifier.

As an illustration of the flexibility of the trunk keys and Monitoring Systems, it would be

a simple matter to broadcast during the afternoon an organ recital from a church beginning at 2 p. m., the closing market quotations at 3 p. m. from the Brown-Marx Building, and to conclude with a concert from the Radio Studio.

In all probability the Studio attracts the most attention from visitors. Upon entering, one is impressed with a certain restfulness and the pleasing appearance of the decorating scheme. One and two light brackets are located upon the walls while an opalescent art fixture is suspended from the center of the ceiling. A novel feature of the Studio is a "pressure-exhaust" system of ventilation which is noiseless in operation and which will completely renew the air in two minutes. The inlet and the outlet for the air cannot be seen. This room was given an acoustical treatment by Johns Manville, Inc.,

sound to them as loud as they are accustomed to hear it in an ordinary room. As a further protection against reflection and disturbing noises, a certain thickness of the same felt was placed under the carpet. In broadcasting, it is imperative that only the original sounds come in contact with the pick-up transmitter. Any reflected sound reaching the diaphragm causes a general confusion and if of sufficient magnitude causes a continual jarring and crashing which would ruin the best concert.

A piano is located in one end of the room and a phonograph cabinet in the other, while a divan occupies the side opposite the door. The cabinet holds an amplifier for the pick-up transmitter. It also holds a desk telephone for conversing with the operator in the building on the roof. A panel on top of the cabinet contains a



The WSY Orchestra has recently played in Montgomery and Mitchell Dam. Very pleasant criticisms of their art were made at both places.

which consisted in covering the walls and ceiling with a very thick vermin-proof felt and placing in front of it a white membrane perforated with three-sixteenth inch holes, spaced a little over one-half inch apart. The membrane extends to the chair rail and below this Monk's Cloth was used. This treatment renders the room "dead." In other words, there is no return of the sound from the walls, ceiling and floor. In an untreated room, reflected sounds reinforce the originals and make them appear to be much louder than they really are. This is very noticeable if the hands are clapped outside and then inside the room. Ordinarily there is a sharp crack, but in the room it is reduced to a dull "plop." Artists on programs for the first time have a tendency to play too loud or strain their voices endeavoring to make the music

green signal light, which notifies the Program Director when the electrical machinery is in operation. In addition, a key (switch) for connecting the pick-up transmitter to the Broadcasting Apparatus is also in evidence. It is a very difficult matter to place a key which will open and close this circuit without seriously disturbing the electrical apparatus which feeds the Antenna System. In this connection, the following has been quoted from a well-known monthly Radio periodical:

"When — was first started the broadcasting studio was located next to the broadcasting apparatus and the station operator made all connections between the studio and the station. This meant that the studio operator in attendance would have to first signal the station operator to turn on the broadcasting apparatus and

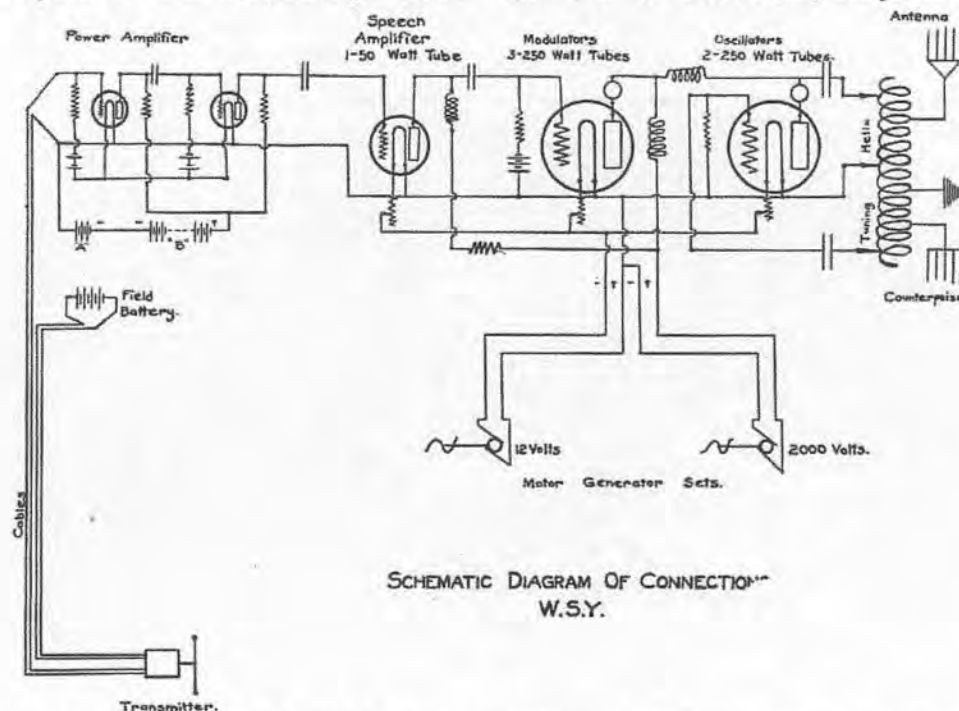
then give the signal to the artists to start, at the same time throwing the microphone or pick-up switch. Owing to this method of dual control, which is still in force at all broadcasting studios, there were unavoidable delays between pieces owing to the difficulty in synchronizing the work of the studio and station operators."

After considerable experimentation a means of overcoming the difficulty was found so that the Program Director of WSY has complete control of the pick-up transmitter, turning it on or off by the simple twist of the wrist.

The problem of distortionless reproduction of music has been a most difficult one from the very inception of radio broadcasting. Trans-

mitters which are used successfully in the every day telephonic transmission of speech are wholly inadequate to reproduce music. This is due to the carbon granules packing between the electrodes, the excessive weight of the moving parts, the greater response of the diaphragm to some frequencies (resonance), etc. During our first year in the broadcasting field we were very forcibly impressed with the inadequacy of this type and determined to eliminate, insofar as possible, the distortion and other undesirable features of imperfect reproduction in the new station. In the first place, a transmitter must be very sensitive so that the weakest sounds may be picked up and at the same time it must keep perfect composure during the loudest sounds. This requirement is essential so that expression

can be given the music. A transmitter must not respond any stronger to one pitch or tone than to another of the same intensity, but must respond to all of the fundamentals and all of the overtones or harmonies present, no matter how weak or how numerous they may be. This preserves the timber or quality of the notes, thus giving to different instruments or different voices their distinctive characteristics. When it is very difficult to recognize an instrument, it is an indication that some of the overtones have been lost or distorted. Transmitters which have given the best results have had small diaphragms and this is absolutely necessary in a studio of small size. We have recently completed a trans-



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mitter made to meet the requirements outlined above and to work upon the electro-dynamic principle. That is, the diaphragm with a coil attached to it is actuated in accordance with the sound vibrations. This coil is placed in a very strong magnetic field and has an electromotive force induced in it in accordance with its forced movement in that field. This generated electromotive force or electrical sound, so weak that it cannot be heard with a sensitive radio receiver of 2,000 Ohms resistance, is then lead to the input of the power amplifier.

The location of the pick-up transmitter with respect to the other electrical apparatus is shown in the schematic diagram of connections. This transmitter, by means of the intermediate

(Continued on Page 30)

at the finish, especially if he finishes at a guest house or camp with an open fire and a good dinner, followed by a smoke and rest. At any rate, those who look on walking as something to be avoided except when absolutely necessary are missing one of the best possible sports and this is especially true in the South where there are no chances to skate, ski or toboggan. Just try it after a hard week's work and see for yourself.

is due them for their faithful and continuously co-operative spirit shown during the trying days when "care," "patience," and "watch your step" were the watch words.

Muscle Shoals

(Continued from Page 26)

Smiley is buying everything that he can think of to add to his.

* * *

Mr. Ames is leaving for an extended trip through the East. He will be gone about two weeks.

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Messrs. Hayward and Crabtree have gone to Mitchell Dam for about six weeks' work, and Paul M. Hocutt, switchboard operator, has been transferred there permanently.

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Mrs. Dallas P. Monk, who has been visiting Mr. and Mrs. H. L. Ames, left this week with Mrs. Ames for a visit to Mr. and Mrs. W. E. Mitchell in Birmingham.

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There was an all-day singing and dinner on the ground in Silver Circle on Sunday, April 29. All that came had a good time, enjoying to the fullest extent the singing and the eats.



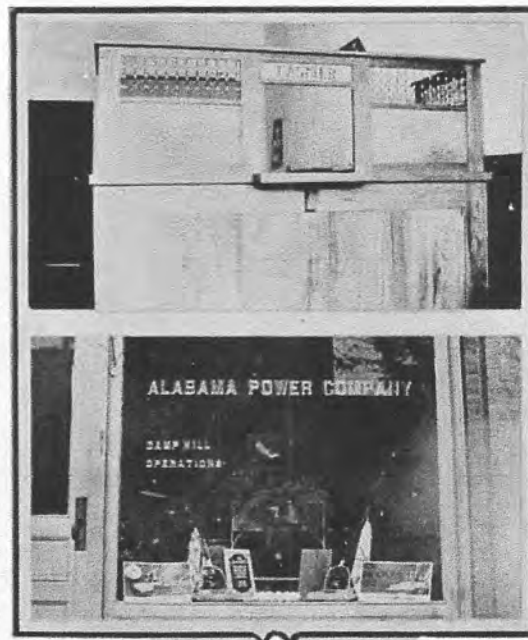
Placing water wheel of Unit No. 2 at Mitchell Dam

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(Continued from Page 12)

amplification and the modulator power tubes, has entire control over the power output of the broadcaster, and when in operation it is capable of varying the plate voltage impressed upon the three 250 Watt modulators and the two 250 Watt oscillators from zero to 3,600 volts.

In conclusion, it might not be out of place to mention that the task of building, installing and adjusting a high-powered radiophone for the exact reproduction of music, from the ground up, including the multitudinous details, is not an easy one. This is especially true when the location is not the best. Radio frequency currents are fickle, to say the least, and demand extremely critical adjustments to pamper them under such conditions. The entire station was constructed and assembled wholly by employes of our Telephone Department and much credit



There is no reason why a small town office should not be as up-to-date as headquarters. For verification of this statement we refer you to D. E. Spinks, Local Manager, at Camp Hill.