since its impedance to low frequencies is very high. In operation, the outputs of the two 6L5G tubes are balanced by the operator to provide proper blending of the highs and lows.

Following the tone corrector stage is the final voltage amplifier and phase inverter tube combined in a single 6C8G dual triode tube. One section of the tube is used as a straight voltage amplifier to drive the top 6N6G tube to its full output. The other section of the tube is employed as a phase inverter to supply the other 6N6G

The amplifier with the cover on.

tube with a signal voltage equal to that of the other tube but 180° out of phase for proper push-pull operation.

Since the gain of the 6C8G tube is approximately 21 in the circuit used, it is necessary to reduce the grid input to the phase inverter section of the tube to 1/21 of the output of the amplifier section. This is accomplished through the use of a 500,000 and 25,000 ohm resistor in series. Thus the phase inverter tube delivers the same voltage to the grid of the bottom 6N6G tube as is delivered to the top section. However, due to the tube action, the voltage is 180° out of phase required for p.p. operation.

The output of the 6C8G tubes are coupled to the grids of the input sections of the 6N6G direct-coupled amplifier tubes in push-pull. These output tubes provide an output of 18 watts. Since the tubes are in push-pull, no cathode bypass condenser is required. This is also true of the 6C8G stage. Note that the plate supply to the input section of the 6N6G tube is obtained after the second choke in the power supply in order to keep the hum level at a low value.

An output transformer has impedances of 2, 4, 9, 15. and 500 ohms.

In keeping with good engineering design, each stage in the amplifier is isolated from the others by means of resistance-capacity filters. As a result there is no noticeable hum or instability in spite of the high gain of 125 DB.

The tubes having d.c. on the heaters are wired in series with the pilot light which acts as a fuse and indicator. This 150 milliampere bulb flickers slightly during the amplifier operation and thus acts as an indicator for proper operation. At full output the pilot light is somewhat brighter than at no output because of the added current drawn by the output tubes, but this is normal.

-30-

The VIDEO Reporter

by W. C. DORF

APPROXIMATELY 100,000 television sets will be sold to the American public in 1939. This prediction was made by Mr. Stanton Griffis, of Paramount Pictures, Inc., at the annual conference of the National Board of Review of Motion Pictures, recently held in New York City. Paramount Pictures with the Dumont Labs, manufacturers of television receivers, cathode-ray tubes, and other tele-equipment, have been carrying on considerable research work in the video field, and with their combined resources this statement has more than a mere wish behind it.

It would appear at first glance that this estimated number of television sets for '39 is a highly optimistic prediction in anybody's language. However, it should be remembered that the prophecy was made for the U. S. and if the job is done right, from transmission to reception, with that very important factor of program cost properly niched, the acceleration of sales might be a chartist's dream of a vertical rising line.

Your reporter discussed this question and others with several manufacturers, laymen, experimenters and amateurs and it was both interesting and enlightening to note their relevant remarks. The executives thought that the figure of 100,000 should be divided by 10. The typical radio listener was of the opinion that the received image had to be good, no recurrence of the scanning disc flop of a few years ago, not too many controls and there would be buyers for sight and sound sets, willing to pay from $100 to $250. Experimenters were somewhat indefinite about the whole thing. However, they asked innumerable questions, what was the cost of a so-and-so C.R. tube, who put out the best kit, when would transmission start, and other inquiries—all of which adds up to —what do you think?

CBS Screens Out Electrical "Bugs"

THE monitor room of Columbia's television transmitter, located on the 74th floor of the Chrysler Building, has been completely screened by a double thickness of finely-woven bronze mosquito netting.

The purpose of these screens is to keep electrical rather than flesh-and-blood "bugs" out of the manitor equipment where images and sounds being televised are checked for the last time before leaving the skyscraper's antenna system. The entire room has been acoustically treated as well and provided with double floors. doors, ceilings and walls to protect the delicate equipment inside from extraneous noises which might tend to blur the sound portions of the programs.

Arrangements also have been made so that both sound and picture signals may be monitored, either as they arrive from CBS television studios in the Grand Central Terminal Building across the street, or just before they are radiated from the tower antenna. CBS television experimental license is W2XAK; its transmitter is designed to operate with a peak power of 30 kw. and provide primary coverage within a radius of about 40 miles. The sound will be on 55.75 mcs. and the picture between 50-55.25 mcs.

New Tele Lab Speeds Progress

THE National Union Radio Corp. announces a complete television testing laboratory to assist, free of charge, radio set makers in the design and manufacture of their sight receivers. Put in operation under the joint direction of W. M. Perkins and M. G. Nicholson, the television "proving grounds" will be available to gauge the efficiency of circuits and equipment. National Union is designing and building its own scientific apparatus which can test precisely, from all engineering and consumer angles, the practicability of sight and sound receiver models.

Latest Aid to Surgery

THE American Television Corp. reports that the surgical amphitheatre of a prominent Brooklyn hospital will soon be equipped to televise actual surgery so that student observers in the medical gallery can see detailed close-ups of the proceedings.

An electric camera, similar to the type used in regular television broadcasts, will be suspended with the lights over the operating table. The equipment designed by their engineers will pick up complete details of the operating and transmit them by cable to the screens of receiving sets located at various points in the gallery and in the offices of

Cause, top;—result, bottom.

surgeons and consultants on other floors of the hospital. The receiving screen will reveal an image about fifteen inches in width.

The televised impulses of light and shade are not radioed as a broadcast, but are confined by wire to the building in which the camera-to-receiver circuit is completed. Each receiving device, known as the "kinet," is equipped with its own cathode ray tube, on which the image appears, and its individual power supply and tuning controls.

FCC News

RECENTLY an application of the Milwaukee Journal Company to inaugurate an experimental television service to the public, and a proposal for television transmission standards, were referred to the Federal Communications Commission for study

(*Televise further on page* 58)

out disrupting the remainder of the transmitter.

Control Console

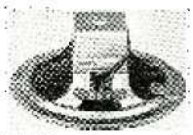
All of the circuits at the station are controlled from this console, and the connecting cables are all long enough so that the desk may be moved to different parts of the room for a change of scenery. The use of key switches makes for rapid changeover. All of the associated equipment for the transmitters is controlled from these switches and the selector switch. A complete picture of the sequence may be had by referring to the schematic diagram of the control panel.

It is not within the scope of this article to cover all of the details in the construction of all of these units and I have merely tried to bring out the more commercial appeal as far as construction is concerned. Perhaps the illustrations can tell the story to best advantage, as, after all, the basic circuits are all tried-and-proven and have appeared many times in print.

Later articles will describe the other transmitters used at this station.

What's New in Radio

(*Continued from page* 34)



make a line of replacement speakers and Uni-match transformers for the trade. These units are designed so that the speaker and its transformer may be used as a replacement in practically any radio. A proper impedance match is a universal feature of the transformer. A rotary switch is supplied on the terminal strip and it is only necessary to turn this switch to the proper point for correct match to the output of the set being used. Further details may be had from the manufacturer.

National Radio Institute, of Washington, D. C., are celebrating their twenty-fifth anniversary. Twenty-five years ago, Mr. James E. Smith began teaching a group of four men in a wireless class. In those days the public thought of radio as a plaything or a passing fad, and saw no possible future for it. Today radio is a $912,000,000 industry and employs 345,000 people in its various branches.

QRD?

(*Continued from page* 36)

good story, true or. . . . With stories like these under his hat, we'd also like to hear from Tim Furlong.

* * *

NOW that wintry weather is fully upon us (ah, for the life of a yacht operator who is now basking in the warm sunshine of southern climes) the east coast vessels are keeping the ops on their toes with their gyrations. One never knows what his next move will be. But whether it rocks beamways or from stem to stern, or whether or not it is okay in every seam perfect spar, there's always the ever-present possibility that some other vessel or plane might be in need of help. So the cans are kept on continuously . . . in spite of Automatic Alarm equipment. That was a very nice piece of work on the part of the *Esso Baytown* which rescued the passengers of the British flying boat *Cavalier*. If not for the coolness and operating ability of the radiop of the *Cavalier*, every one would have gone to an icy-water grave. As it was, three were lost. . . . So stick to your cans, just in case.

* * *

IT was a pleasure to hear from "Ham" William Drebert, Moravian College for Men. To get into the Airways, one must pass a civil service examination. Details of the time and place of examinations can best be obtained by writing to the *Department of Commerce, Washington, D. C.* The aviation companies must be contacted separately. As for ship berths, the field is rather well filled and a second class ticket without any previous experience would have to first get "apprentice" experience before you could possibly take a boat out by yourself. Good luck to you.

* * *

LETTERS occasionally come over the desk that require a straightforward answer. In other words, "no beating around the bush." There are a lot of chaps who believe that some of the men holding down various jobs on ship stations and broadcasts don't know, as one fellow puts it, "the difference between a modulator and an egg-beater." He moans that they're holding the billet while he's still on the available list. Well, brother brass-pounders, all I can say is that if these "know-nothings" have the berths, then they must have their tickets to operate. And if they have their tickets, then they must know their stuff, because I've never heard of an *RI* who could be bribed. As a matter of fact, the nephew of an *RI* was flunked because he was given some extra questions, in addition to the regular examination, which he couldn't answer. So instead of thinking the other guys don't know what it's all about, it's a good idea, instead, to take that time to build up our own knowledge.

And now that '39 is well under way, let's hope for peace and good shipping from all ports . . . so with 73 . . . ge . . . GY.

—30—

Video Reporter

(*Continued from page* 14)

and recommendation. As the FCC remarked, the Journal Company's application is the first looking to establishment of an experimental program service for reception in the home as distinguished from fundamental research or technical experimentation in the art of developing television apparatus. The Commission has previously issued a number of licenses for technical experimentation only.

The proposed standards for television transmission were recommended to the Commission recently by the Radio Manufacturers Association. The Commission has taken no action upon the recommendation. Some manufacturers and experimenters have expressed opposition to the promulgation of standards.

World's Fair Television

RESPONDING to the rapidly mounting interest in the advent of public television, which is expected to coincide with the opening April 30 of the New York World's Fair 1939, the Radio Corporation of America announced a decision to almost completely revise its exhibition plans at the Fair in order to increase the scope and effectiveness of the television presentation.

Original plans for the RCA exhibit building drawn up more than a year ago, provided six ground-floor rooms where television was to be viewed under conditions simulating those of the home. Because these accommodations are now looked upon as inadequate, RCA is redesigning the ground-floor arrangement to greatly enhance the utility of the available space.

One phase of the revision which has been agreed upon, however, is the retention of two of the original viewing rooms for the

purpose of presenting the Television Living Room of Today and the Radio Living Room of Tomorrow. The television living room will be decorated with period furniture, featuring one of the new model home television receivers. The Radio Living Room of Tomorrow, decorated in the most advanced style of modern furniture, will present in some form yet to be designed a combination of sound broadcasting, television, facsimile broadcasting, phonograph recording, and phonograph record playing. The RCA exhibit building, erection of which was completed about a month ago, is shaped like a huge radio tube affixed to a base and the whole lying on its side.

Add These to Your List

THE FCC has just assigned the following experimental television broadcast call to the General Electric Company: W2XB, Albany, N. Y.; W1XA, Bridgeport, Conn.; W2XD and W2XH, Schenectady, N. Y. The frequency band for the Albany and Bridgeport stations shall be 60,000 to 86,000 kc. and the Schenectady stations' frequency band shall be 42,000 to 56,000 kilocycles, with 40 watts power.

Tele-Casts

RECENTLY a Broadway columnist reported that RCA was contemplating forming a new company to take care of television exclusively. The new company was to operate under the name of the *Television Corp. of America* with Lenox Lohr as its headman. —30—

Practical Oscillator

(*Continued from page* 16)

there is not any too much room in the can for an extended jack frame. The right cabinet wall makes a good spot for the male receptacle for power cable plug and the top of the can or the front panel seems the right location for the binding post output assembly.

No chassis need be employed. Sockets for the plug-in crystal and for V_1 and V_2 may be of the above-chassis type, mounted directly on the bottom plate which is provided with the can. The various condensers and resistors may go anywhere, but they should be positioned to permit short leads to the associated components, particularly if we are to get away with a layout which will not involve shielding between circuit groupings.

No wiring instructions need be given. If the layout is followed and the usual precautions are taken the business of making proper connections will take care of itself. Some leads *should* be run through low capacity shield tubing, if it is found advisable to isolate stages; and to prevent unwanted coupling; but we will refrain from giving any definite suggestions along this line, as it is entirely possible to wire up the job without the use of shielding anywhere at all.

Some items, say, C_3, R_1, and R_2, may be connected directly at the socket terminals.

Check the wiring and measure the available B voltage for operation. The voltage may be the conventional 250, providing R_8 is of sufficient resistance to drop the potential to about 180 as measured at the V_1-r.f. plate. Whatever this voltage, be definitely sure that its value is brought down to at least 180 v. Use a variable resistor at R_8—or try out various resistors until the r.f. B+ does get down where it belongs. So long as the crystal will oscillate, voltage less than 180 will be satisfactory; but one should never go higher, as filter crystals plugged into the circuit might be ruined.

Plug in any available crystal [Ed. Note: 10 and 20 meter crystals are not suited for use in this type of circuit, as they are normally ground to 60 meter fundamental] insert a milliameter of 0-10 range in the meter jack, with the two tubes inserted with the power cable connected. Adjust the switch so that either one or the other r.f. choke-grid condenser combinations is in circuit, depending upon which is in order for oscillation with the particular crystal employed. If the reading is high—somewhere in the neighborhood of 8 ma.—then the Pierce circuit is not oscillating, and C_1, if a variable, should be adjusted in value until oscillation, as evidenced by a sharp current drop, is obtained. If the reading is about 4 ma. and if this reading jumps to a higher value as the crystal is touched with the finger, then the circuit is oscillating properly.

It should be possible to obtain zero modulation; if any amount of modulated signal is present with R_7 in the off position, then this or the tone control should be provided with a switch cut into the lead between R_9 and B+.

The note, with modulation up, will be about 400 cycles in frequency, as we have previously explained. If a higher tone is called for, the pitch control may be advanced—or the alternative fixed-tone selector switch adjusted to bridge a desired condenser across the secondary.

Modulated or unmodulated, the signal should and will be controllable down to practically zero output through adjustment of R_5.

Application

We should like to point out, if we have not done so already, that this design becomes of particular interest not only to the amateur or professional radioman, but to the layman who desires to keep his superhet in peak operating condition at all times.

The layman should first find out the peak i.f. frequency for his particular receiver. Any serviceman should be able to give him this information. He should then obtain a low cost crystal cut to this frequency and inserted into